This document is based on European standards and is not valid for use in U.S.A.

Compact / CANopen / Logic Controller / M238 + Optimized Packaging

System User Guide

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Schneider Electric

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Important Information

NOTICE Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** equipment damage.

PLEASE NOTE Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and the installation, and has received safety training to recognize and avoid the hazards involved

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Before You Begin

Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to **the operator of that machine.**

> **⚠ WARNING**
>
> **UNGUARDED MACHINERY CAN CAUSE SERIOUS INJURY**
> - Do not use this software and related automation products on equipment which does not have point-of-operation protection.
> - Do not reach into machine during operation.
>
> **Failure to follow these instructions can cause death, serious injury or equipment damage.**

This automation equipment and related software is used to control a variety of industrial processes. The type or model of automation equipment suitable for each application will vary depending on factors such as the control function required, degree of protection required, production methods, unusual conditions, government regulations, etc. In some applications, more than one processor may be required, as when backup redundancy is needed.

Only the user can be aware of all the conditions and factors present during setup, operation and maintenance of the machine; therefore, only the user can determine the automation equipment and the related safeties and interlocks which can be properly used. When selecting automation and control equipment and related software for a particular application, the user should refer to the applicable local and national standards and regulations. A "National Safety Council's" Accident Prevention Manual also provides much useful information.

In some applications, such as packaging machinery, additional operator protection such as point-of-operation guarding must be provided. This is necessary if the operator's hands and other parts of the body are free to enter the pinch points or other hazardous areas and serious injury can occur. Software products by itself cannot protect an operator from injury. For this reason the software cannot be substituted for or take the place of point-of-operation protection.

Ensure that appropriate safeties and mechanical/electrical interlocks for point-of-operation protection have been installed and are operational before placing the equipment into service. All mechanical/electrical interlocks and safeties for point-of-operation protection must be coordinated with the related automation equipment and software programming.

NOTE: Coordination of safeties and mechanical/electrical interlocks for point-of-operation protection is outside the scope of this document.

START UP AND TEST

Before using electrical control and automation equipment for regular operation after installation, the system should be given a start up test by qualified personnel to verify correct operation of the equipment. It is important that arrangements for such a check be made and that enough time is allowed to perform complete and satisfactory testing.

⚠ CAUTION

EQUIPMENT OPERATION HAZARD

- Verify that all installation and set up procedures have been completed.
- Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.
- Remove tools, meters and debris from equipment.

Failure to follow these instructions can result in injury or equipment damage.

Follow all start up tests recommended in the equipment documentation. Store all equipment documentation for future reference.

Software testing must be done in both simulated and real environments.

Verify that the completed system is free from all short circuits and grounds, except those grounds installed according to local regulations (according to the National Electrical Code in the U.S.A, for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to prevent accidental equipment damage.

Before energizing equipment:

- Remove tools, meters, and debris from equipment.
- Close the equipment enclosure door.
- Remove ground from incoming power lines.
- Perform all start-up tests recommended by the manufacturer.

OPERATION AND ADJUSTMENTS

The following precautions are from NEMA Standards Publication ICS 7.1-1995 (English version prevails):

- Regardless of the care exercised in the design and manufacture of equipment or in the selection and rating of components, there are hazards that can be encountered if such equipment is improperly operated.

- It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer's instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer's instructions and the machinery used with the electrical equipment.

- Only those operational adjustments actually required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Only use software tools approved by Schneider Electric for use with this equipment.
- Update your application program every time you change the physical hardware configuration.

Failure to follow these instructions can cause death, serious injury or equipment damage.

Introduction

Introduction

This document is intended to provide a quick introduction to the described System. It is not intended to replace any specific product documentation, nor any of your own design documentation. On the contrary, it offers additional information to the product documentation, for installing, configuring and implementing the system.

The architecture described in this document is not a specific product in the normal commercial sense. It describes an example of how Schneider Electric and third-party components may be integrated to fulfill an industrial application.

A detailed functional description or the specification for a specific user application is not part of this document. Nevertheless, the document outlines some typical applications where the system might be implemented.

The architecture described in this document has been fully tested in our laboratories using all the specific references you will find in the component list near the end of this document. Of course, your specific application requirements may be different and will require additional and/or different components. In this case, you will have to adapt the information provided in this document to your particular needs. To do so, you will need to consult the specific product documentation of the components that you are substituting in this architecture. Pay particular attention in conforming to any safety information, different electrical requirements and normative standards that would apply to your adaptation.

It should be noted that there are some major components in the architecture described in this document that cannot be substituted without completely invalidating the architecture, descriptions, instructions, wiring diagrams and compatibility between the various software and hardware components specified herein. You must be aware of the consequences of component substitution in the architecture described in this document as substitutions may impair the compatibility and interoperability of software and hardware.

⚠ CAUTION

EQUIPMENT INCOMPATIBILITY OR INOPERABLE EQUIPMENT

Read and thoroughly understand all hardware and software documentation before attempting any component substitutions.

Failure to follow these instructions can result in injury or equipment damage.

This document describes a generic architecture based on Modicon M238 Logic controller G-Type and a packaging architecture based on Modicon M238 Logic controller S-Type.

Abbreviations

Abbreviation	Signification
AC	Alternating Current
CB	Circuit Breaker
CFC	Continuous Function Chart - a programming language based on function chart
DI	Digital Input
DO	Digital Output
DC	Direct Current
DFB	Derived Function Blocks
EDS	Electronic Data Sheet
E-STOP	Emergency Stop
FBD	Function Block Diagram - an IEC-61131 programming language
HMI	Human Machine Interface
I/O	Input/Output
IL	Instruction List - a textual IEC-61131 programming language
LD	Ladder Diagram - a graphic IEC-61131 programming language
PC	Personal Computer
POU	Programmable Object Unit, Program Section in SoMachine
PDO	Process Data Object (CANopen)
PS	Power Supply
RMS	Root Mean Square
RPM	Revolution Per Minute
RPDO	Receive Process Data Object (CANopen)
SE	Schneider Electric
SFC	Sequential Function Chart - an IEC-61131 programming language
SDO	Service Data Object
ST	Structured Text - an IEC-61131 programming language
TPDO	Transmit Process Data Object (CANopen)
TVDA	Tested, Validated and Documented Architecture
VSD	Variable Speed Drive
WxHxD	Dimensions: Width, Height and Depth

Glossary

Expression	Signification
Altivar (ATV)	SE product name for a family of VSDs
CANopen	Name for a communications machine bus system
Harmony	SE product name for a family of switches and indicators
ILA, ILE	SE product name for a integrated drive Lexium
Lexium (LXM)	SE product name for a family of servo drives
Magelis	SE product name for a family of HMI devices
Modicon M238 Logic controller	SE product name for Programmable Logic Controller
Modbus	A Communications protocol
OsiSense	SE product name for a family of sensors
Phaseo	SE product name for a family of power supplies
PLCopen	An international standard for industrial controller programming.
Preventa	SE product name for a family of safety devices
SoMachine	SE product name for an integrated software tool
TeSys	SE product name for a family for motor protection devices and load contactors
Vijeo Designer	SE product name for Magelis HMI devices configuration software

Application Source Code

Introduction

The example source code is in the form of configuration, application and import files. Use the appropriate software tool to either open or import the files.

Extension	File Type	Software Tool Required
CSV	Comma Separated Values, Spreadsheet	MS Excel
DOC	Document file	Microsoft Word
DWG	Project file	AutoCAD
EDS	Electronic Data Sheet - Device Definition	Industrial standard
PDF	Portable Document Format - document	Adobe Acrobat
PROJECT	Project file	SoMachine
VDZ	Project file	Vijeo Designer
ZW1	Project archive file	EPLAN P8

Typical Applications

Introduction

Here you will find a list of the typical applications, and their market segments, where this system or subsystem can be applied:

Hoisting
- Gantry crane
- Overhead traveling crane

Conveying
- Roller Bed
- Turn table
- Transfer

Packaging
- Filling & closing machines
- Vertical bagging machines
- Boxing machines
- Carton closing / erecting machines
- Shrink Wrapping machines
- Labeling machines

Textile
- Opening and closing machines
- Circular knitting machines
- Plucking machines
- Blending machines
- Carding machines
- Drawing frame machines
- Combing machines
- Ring Spinning machines
- Scouring Bleaching machines
- Jigger machines
- Pre shrinking machines

Pumping
- Booster stations
- Compressors
- Vacuum pumps

Others
- Winding / Unwinding machines
- Wood working machines
- Cutting machines
- Sander machines
- Sawing machines

SPECIAL NOTE
The products specified in this document have been tested under actual service conditions. Of course, your specific application requirements may be different from those assumed for this and any related examples described herein. In that case, you will have to adapt the information provided in this and other related documents to your particular needs. To do so, you will need to consult the specific product documentation of the hardware and/or software components that you may add or substitute for any examples specified in this documentation. Pay particular attention and conform to any safety information, different electrical requirements and normative standards that would apply to your adaptation.

The application examples and descriptions contained in this document have been developed based on products and standards available and defined for Europe. Some or all of the application examples may contain recommendations of products that are not available in your country or locality, or may recommend wiring, products, procedures or functions that are in conflict with your local, regional or national electrical or safety codes and/or normative standards.

⚠ WARNING

REGULATORY INCOMPATIBILITY

Be sure that all equipment applied and systems designed comply with all applicable local, regional and national regulations and standards.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTE:
The information in this document is based on European standards and may not be valid for use in the U.S.A.

The use and application of the information contained herein require expertise in the design and programming of automated control systems. Only the user or integrator can be aware of all the conditions and factors present during installation and setup, operation, and maintenance of the machine or process, and can therefore determine the automation and associated equipment and the related safety provisions and interlocks which can be effectively and properly used. When selecting automation and control equipment, and any other related equipment or software, for a particular application, the user or integrator must also consider any applicable local, regional or national standards and/or regulations.

System

Introduction

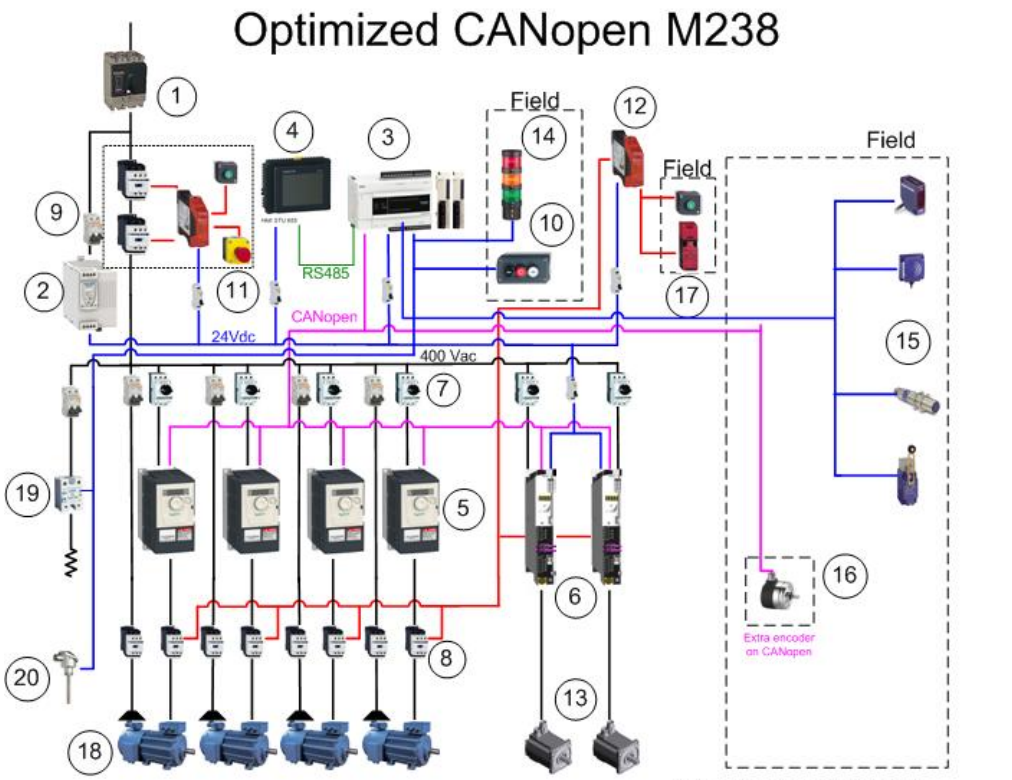
The system chapter describes the architecture, the dimensions, the quantities and different types of components used within this system.

Architecture

General

The controller in this application is a Modicon M238 Logic controller. The user can control the application using the Magelis HMI device. The VSDs, servo drives and FTBs are connected to the M238 via a CANopen bus. The example application includes two functional safety options according to IEC 61508 standards: an Emergency Stop function supervised by a Preventa safety module (see the appropriate hardware manual), plus a second Preventa safety module to evaluate protective door sensors.

Layout



1. Compact NSX main switch
2. Phaseo power supply ABL8
3. Modicon M238 Logic controller
4. Magelis graphic HMI STU 655
5. Altivar 312 variable speed drive
6. Lexium 32 servo drive
7. TeSys motor protection GV2L
8. TeSysD contactor LC1D
9. Multi9 circuit breaker
10. Harmony push buttons enclosure XALD
11. Harmony e-Stop enclosure XALK
12. Preventa safety module XPS
13. Lexium servo motor BMH
14. Tower Light
15. OsiSense sensors (optional)
16. OsiSense CANopen encoder XCC
17. Preventa safety switch XCS
18. Standard AC motor
19. Solid state relay with a heating element
20. Temperature sensor

Components

Hardware:

- Main switch type Compact NSX100F
- GV2L motor circuit breaker
- Altivar 312 variable speed drive with integrated CANopen interface
- Emergency Stop switch with rotation release (trigger action)
- Magelis STU655 HMI
- Phaseo Power supply ABL8
- Modicon M238 Logic Controller
- Lexium 32A servo drive
- OsiSense (Osicoder)
- Harmony pushbuttons
- Preventa XPS safety module
- TeSysD load contactors

Software:

- SoMachine V3.0

Quantities of Components

For a complete and detailed list of components, the quantities required and the order numbers, please refer to the components list at the rear of this document.

Degree of Protection

Not all the components in this configuration are designed to withstand the same environmental conditions. Some components may need additional protection, such us housings, depending on the environment in which you intend to use them. For environmental details of the individual components please refer to the list in the appendix of this document and the corresponding user manual.

Cabinet Technical Data

Input	Mains voltage	400 Vac
	Power requirement	~ 11 kW
	Cable size	5 x 2.5 mm² (L1, L2, L3, N, PE)
	Cable connection	3 phase + Neutral + Ground Neutral is needed for 230 Vac (Phase and Neutral)
Output	Motor power ratings	2 asynchronous motors (4 poles:1500 RPM) controlled by ATV312 (0.37 kW) 2 asynchronous motors (4 poles:1500 RPM) controlled by ATV312 (0.75 kW) 2 servo motors (BMH type with brake) controlled by LXM32 (continuous output current: 6 A RMS at 6000 RPM)

Functional Safety Notice

(EN ISO13849-1 EN IEC62061)

The standard and level of functional safety you apply to your application is determined by your system design and the overall extent to which your system may be a hazard to people and machinery.

Whether or not a specific functional safety category should be applied to your system should be ascertained with a proper risk analysis.

This document is not comprehensive for any systems using the given architecture and does not absolve users of their duty to uphold the functional safety requirements with respect to the equipment used in their systems or of compliance with either national or international safety laws or regulations.

Emergency Stop

Emergency Stop / Emergency Disconnection function

This function for stopping in an emergency is a protective measure which compliments the safety functions for the safeguarding of hazardous zones according to prEN ISO 12100-2.

Safety Functions

Door guarding

up to Performance Level (PL) = b, Safety Integrity Level (SIL) = 1

Dimensions

The dimensions of the individual devices used; controller, drives, power supply, etc. require a housing cabinet size of at least 600 x 1800 x 400 mm (WxHxD).

The HMI display, illuminated indicators such as “SYSTEM ON“, “SYSTEM OFF“ or “ACKNOWLEDGE EMERGENCY OFF” as well as the Emergency Stop switch itself, can be built into the door of the cabinet.

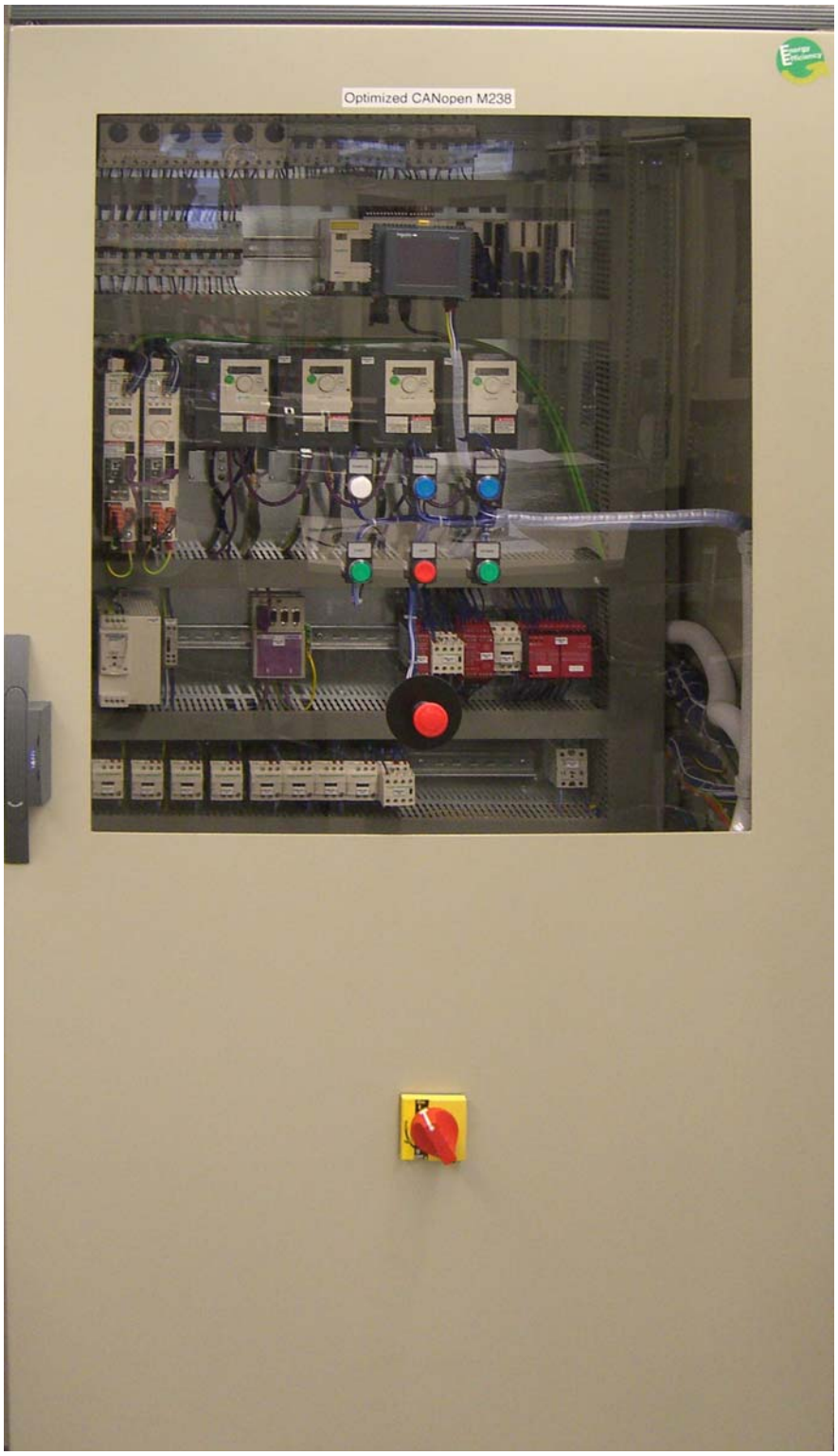
Installation

Introduction

This chapter describes the steps necessary to set up the hardware and configure the software required to fulfill the described function of the application.

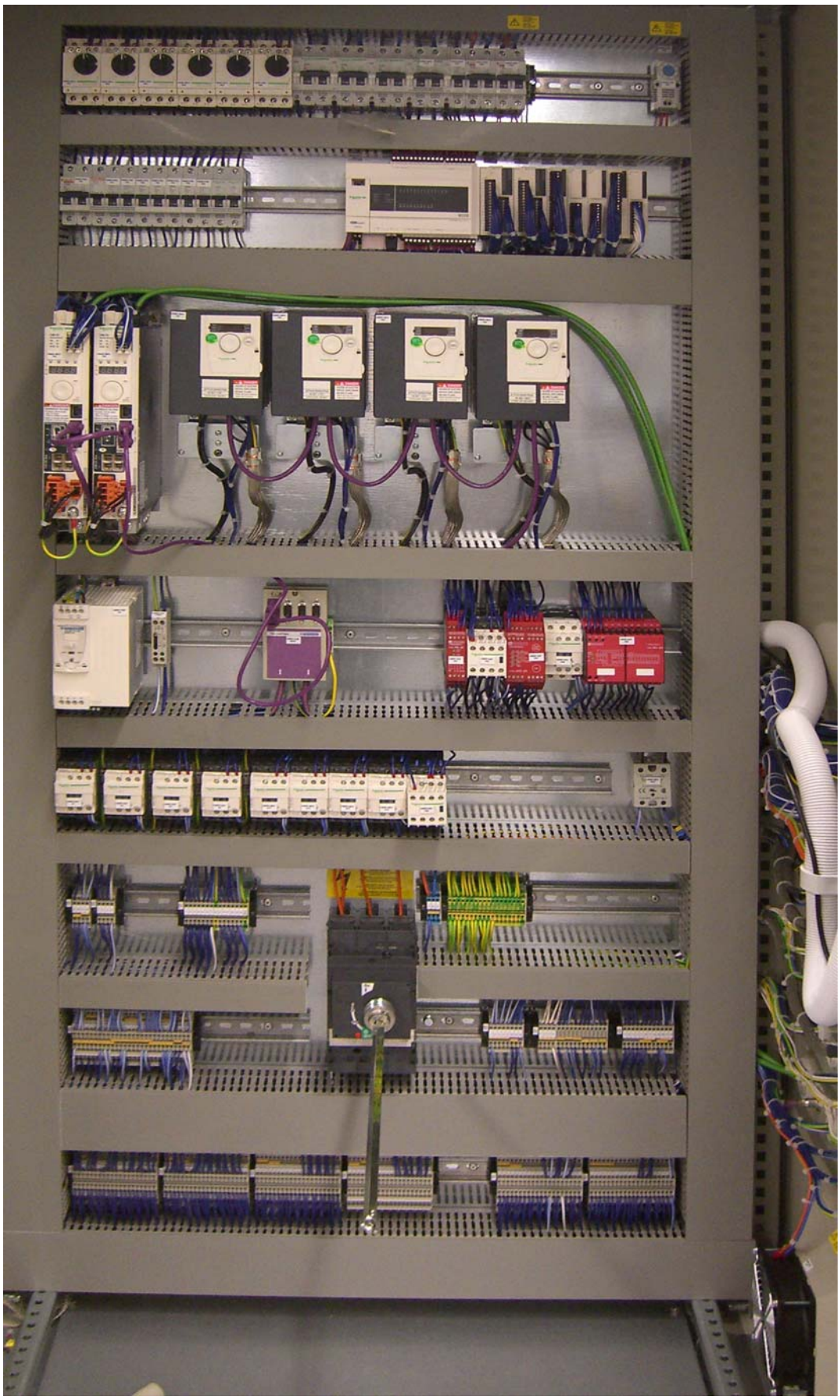
Assembly Main rack H1

Front

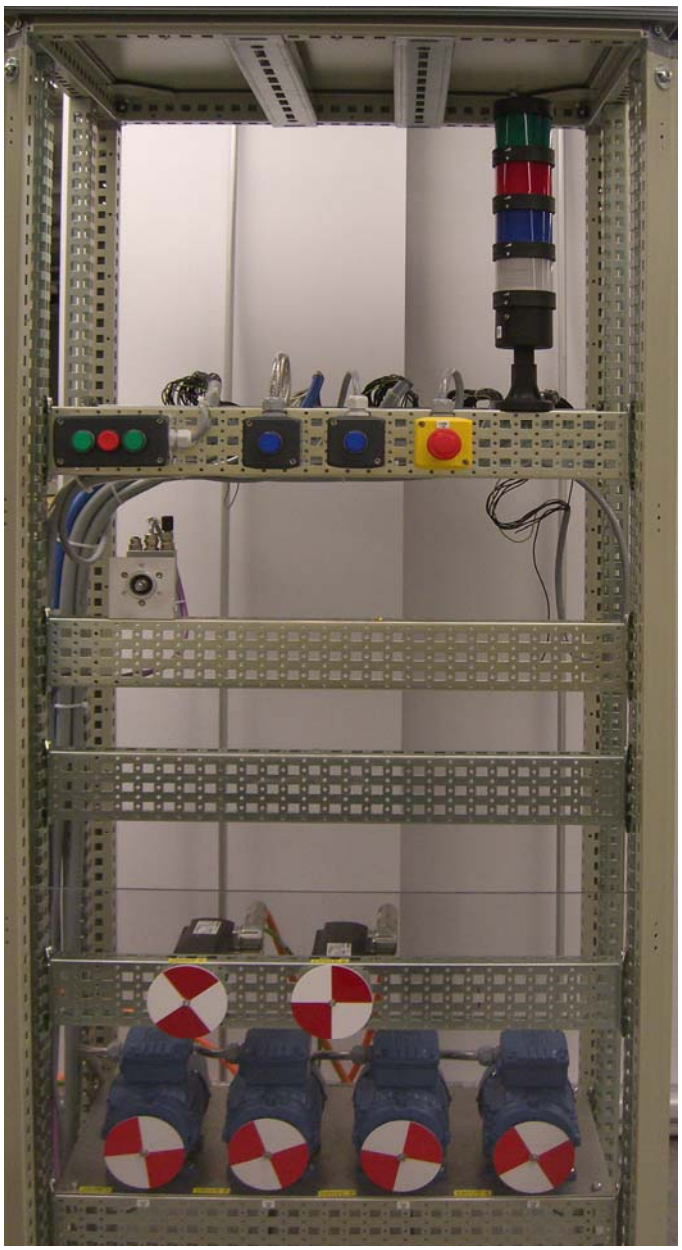


Main rack H1

Interior



Distributed rack H2



Notes

The components designed for installation in a cabinet, i.e. the controller, safety modules, circuit breakers, contactors, motor circuit breakers and power supply can be mounted on a 35 mm DIN rail.

Main switch, solid state relays, Lexium 32A servo drives and Altivar 312 variable speed drives are screwed directly onto the mounting plate. Alternatively, if an adapter is used the Altivar 312 can be mounted on a DIN rail.

The OsiSense (Osicoder) CANopen encoder is installed in the field.

The Emergency Stop button, the door safety switches and the pushbutton housing for the display and acknowledgement indicators are designed for on-wall mounting in the field. All switches (except the door guard switch) can also be installed directly in a control cabinet (e.g., in a cabinet door) without special housings.

There are two options for installing XB5 pushbuttons or indicator lamps: These pushbuttons or switches can be installed either in a 22 mm hole, e.g., drilled into the front door of the control cabinet, or in an XALD-type housing suitable for up to 5 pushbuttons or indicator lamps. The XALD pushbutton housing is designed for backplane assembly or direct wall mounting.

The individual components must be interconnected in accordance with the detailed circuit diagram in order to ensure that they function correctly.

- 400 Vac 3-phase or 230 Vac 1-phase wiring for the motion and drive circuitry (LXM32A and ATV312).
- 400 Vac 3-phase wiring between the main circuit breaker, drives, motor starters and motors.
- 230 Vac 1-phase wiring between the main circuit breaker and Lexium servo drives
- 230 Vac 1-phase wiring between the main circuit breaker and primary side of the 24 Vdc power supply
- 24 Vdc wiring for the control circuits, the controller’s power supply, the I/O modules and the HMI.

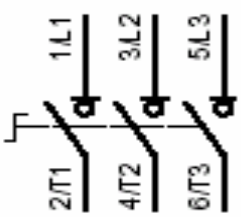
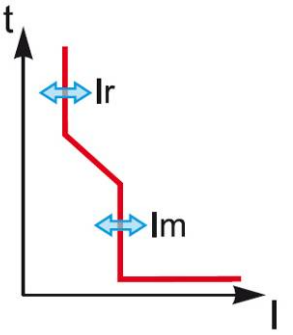
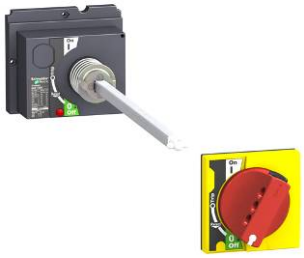
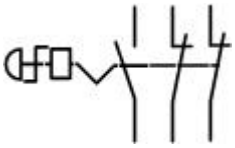
CANopen cables are installed for the communications link between the controller, the ATV312, LXM32A, and OsiSense (Osicoder).

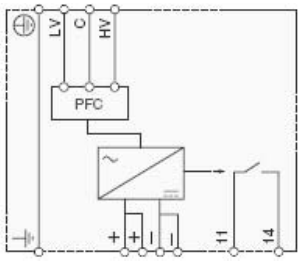
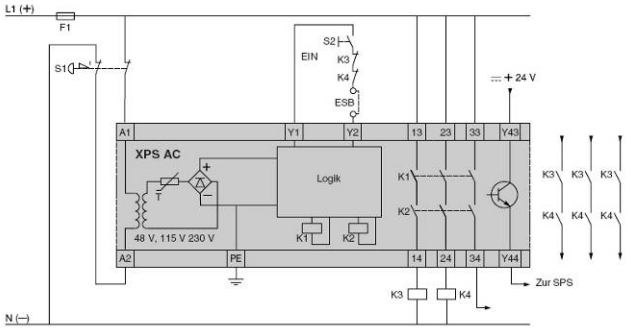
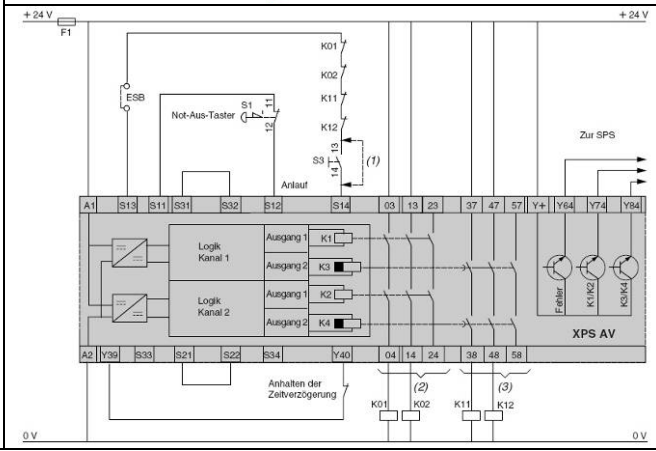
Serial line cable is installed for the communication link between the controller and the HMI.

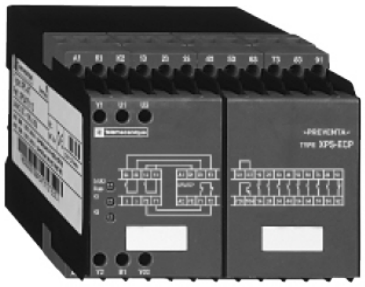
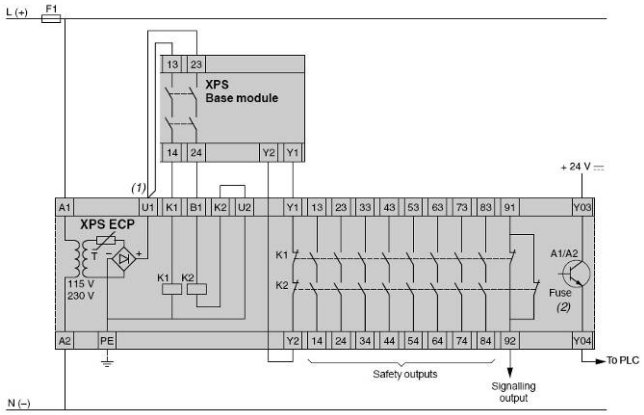
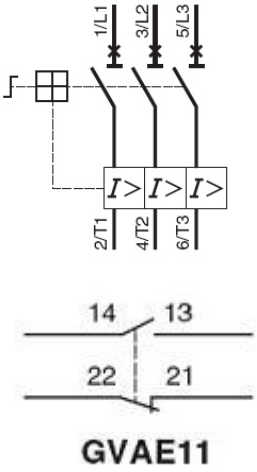
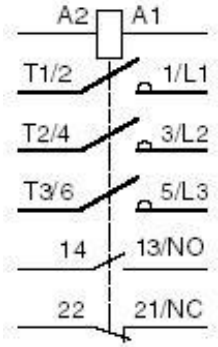
Hardware

General

General description of the hardware.

Main Switch **Compact NSX100F** **LV429003** 36 kA 380/415 Vac		
Main Switch **Compact NSX100F** **LV429037** Trip unit TM16D Thermal-magnetic 16 A		 Ir - Thermal protection Im - Magnetic protection
Main Switch **Compact NSX100F** **Rotary handle** **LV429340** **Terminal shield** **LV429515**	 Rotary handle with red handle on yellow front	 Terminal shield short
Emergency Stop **Harmony** **switch** (trigger action) **XALK178G**		

Phaseo **ABL8RPS24100** **Power supply** 24 Vdc, 10 A		
Safety Module **Preventa** **XPSAC5121** for Emergency Stop		
		
Safety Module **Preventa** **XPSAV11113Z002** for door guard		
		

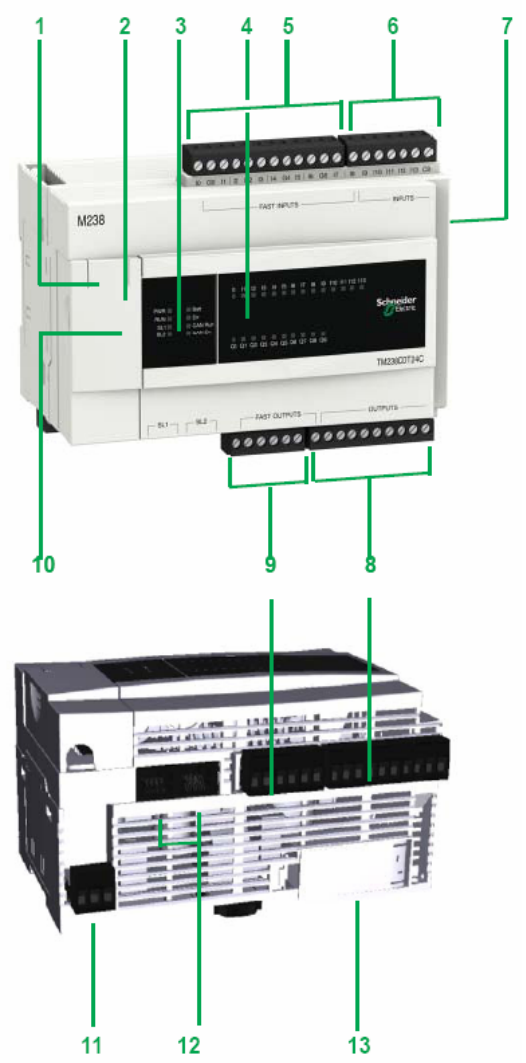
Preventa **Expansion Module** **XPSECP5131**		
		
Motor Circuit Breaker **GV2L08** **and** **GV2L14** with auxiliary contact **GVAE11**		
Contactor **TeSysD** **LC1D18BL**		
Modicon M238 **Logic controller** **TM238LFDC24DT** 14 Digital Inputs 10 Digital Outputs		

Modicon M238

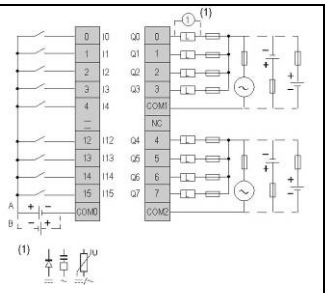
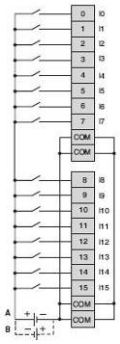
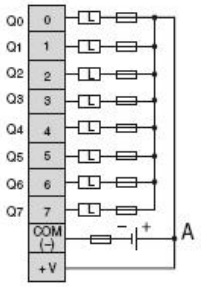
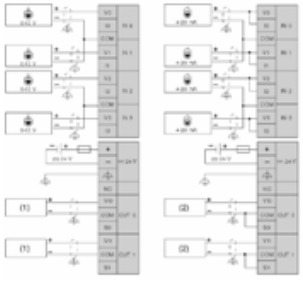
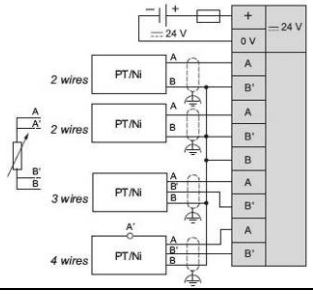
Logic controller

TM238LFDC24DT

14 Digital Inputs
10 Digital Outputs



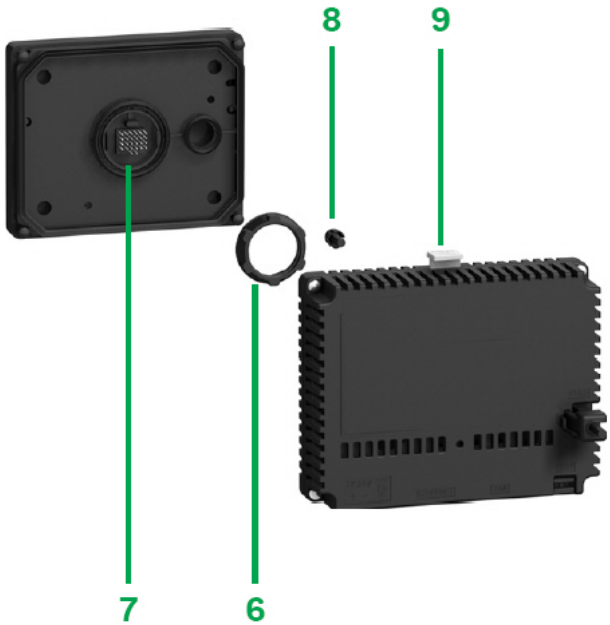
1. Mini B USB Port, for a programming terminal.
2. A hinged access cover with 2 cable glands (1 removable for the terminal cord set and 1 for the CANopen cable).
3. The controller status by means of 4 LEDs (PWR, RUN, Batt and Err) and The integrated communication port status by means of 4 LEDs
(SL1, SL2,CAN Run and CAN Err.).
4. A display unit showing the I/O states (I0…I13 and Q0…Q9).
5. A removable screw terminal block (12 terminals) for connecting the sensors (24 Vdc fast inputs).
6. A removable screw terminal block (7 terminals) for connecting the sensors (24 Vdc inputs).
7. A connector for discrete TM2 Dpp, analog TM2 App and counter TM200 HSC210Dp I/O extension modules (7 modules max.).
8. A removable screw terminal block (10 terminals) for connecting the 6 pre-actuators (24 V c outputs).
9. A removable screw terminal block (6 terminals) for connecting the 4 pre-actuators (24 V c fast outputs).
10. A removable screw terminal block (5 terminals marked CANopen) for connection to the CANopen bus, with model TM238 LFDC24DT.
11. A non-removable screw terminal block (3 terminals +, -, t marked 24 Vdc) for connecting the 24 Vdc power supply, With access from the underside of the controller.
12. 2 RJ 45 connectors for connection of 2 serial links) marked SL1 and SL2 (Modbus /SoMachine protocol).
13. A hinged cover for accessing the optional backup battery for the RAM memory and the real-time clock inside the base.

TM2 I/O Module **TM2DMM24DRF** 16 Digital Inputs 8 Digital Outputs		
TM2 I/O Module **TM2DDI16DT** 16 Digital Inputs		
TM2 I/O Module **TM2DDO8UT** 8 Digital Outputs		
TM2 I/O Module **TM2AMM6HT** 4 Analog Inputs 2 Analog Outputs		
TM2 I/O Module **TM2AMI4LT** 4 Analog Inputs		

Magelis HMI

HMISTU655

Exploded view of Magelis STU Small Panel: simple installation by means of a 22 mm diameter hole



A Magelis STU Small Panel is made up of a front module (comprising the screen) and a rear module (comprising the CPU plus terminals and connectors). The two modules are fixed together by means of a hole measuring 22 mm in diameter. The fixing system contains the following elements:

6 An adjusting nut

7 A seal

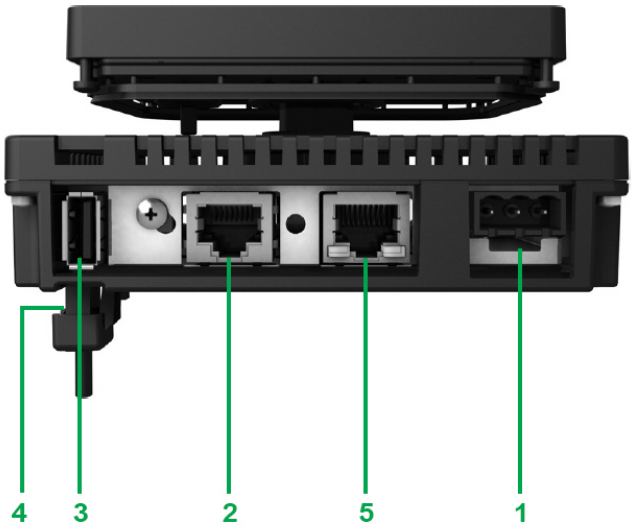
8 An anti-rotation tee (can be used as an option)

9 A release mechanism: simply press to separate the two modules once they have been fixed together

Magelis HMI

HMISTU655

Power and communication connectors



1 A removable screw terminal block for the 24 V ⎓ power supply

2 An RJ45 connector for RS 232C or RS 485 serial link connection to PLCs (COM1)

3 A USB type A host connector for:
- Connection of a peripheral device
- Connection of a USB memory stick
- Application transfer

4 A USB mini-B device connector for application transfer (on the left-hand side)

5 An RJ45 connector for the Ethernet TCP/IP 10BASE-T/100BASE-TX link

Servo Drive

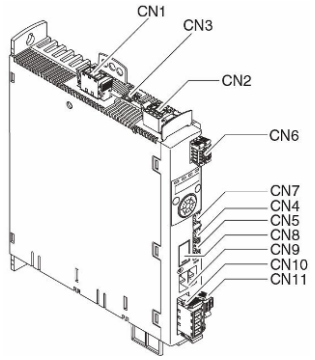
Lexium 32A

LXM32AD18M2

1-phase

230 Vac

Continuous output current:
6 A RMS at 6000 RPM



Connection	Assignment
CN1	Power stage supply voltage
CN2	24 controller supply voltage and STO safety function
CN3	Motor encoder (encoder 1)
CN4	PTO (encoder simulation ESIM)
CN5	PTI (pulse/direction, A/B, CW/CCW)
CN6	Analog inputs and digital inputs/outputs
CN7	Modbus (commissioning interface)
CN8	External braking resistor
CN9	DC bus connection for parallel operation
CN10	Motor phases
CN11	Holding brake

Servo Drive

Lexium 32A

LXM32AD18M2

Embedded Human Machine Interface

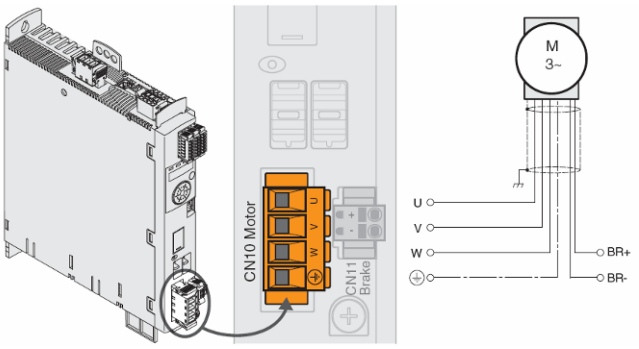
Servo Drive

Lexium 32A

1-phase

LXM32AD18M2

Wiring diagram
Power cable connection to motor (Length 3 m)



Connection	Meaning	Color
U	Motor phase	Black L1 (BK)
V	Motor phase	Black L2 (BK)
W	Motor phase	Black L3 (BK)
PE	Protective ground conductor	Green/yellow (GN/YE)
BR+	Holding brake +	White (WH)
BR-	Holding brake -	Gray (GR)

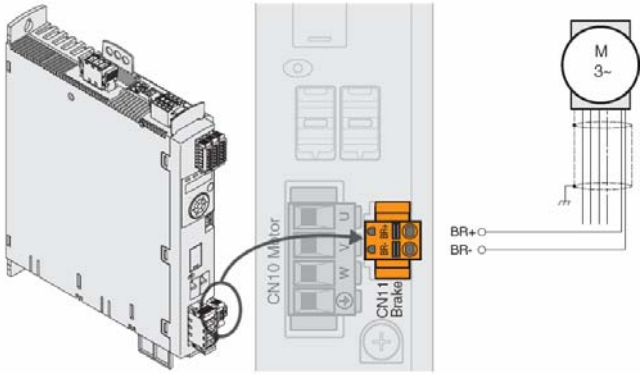
Servo Drive

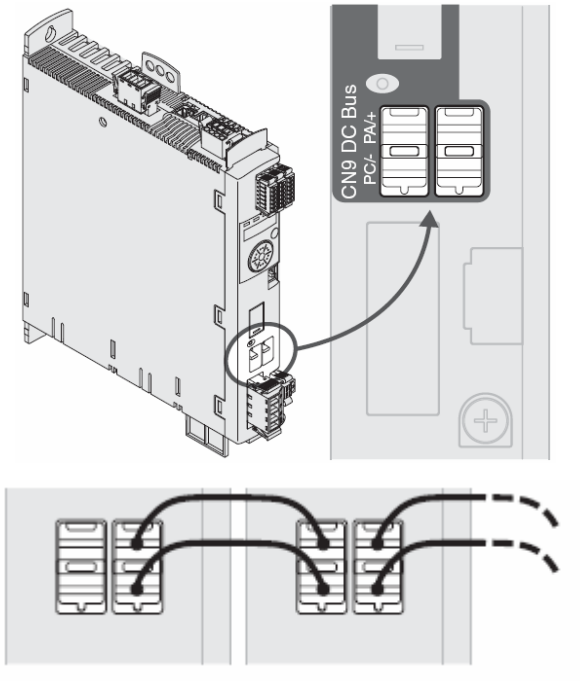
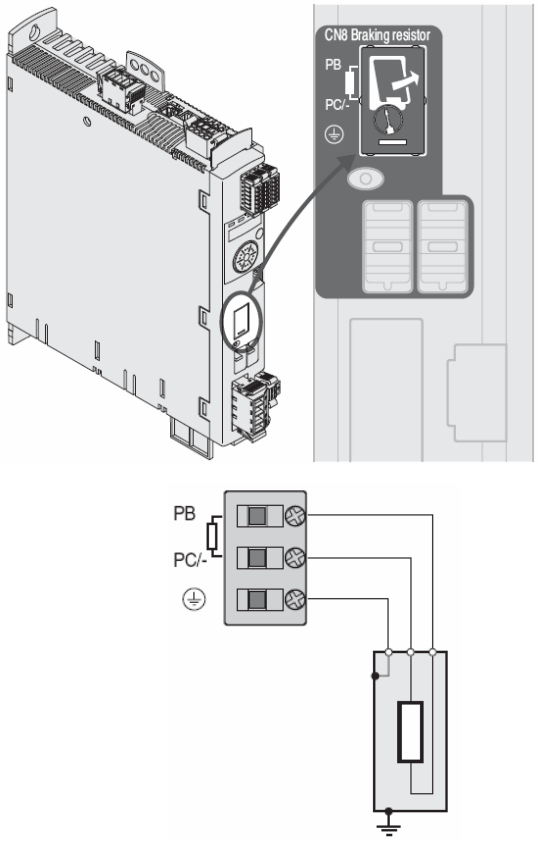
Lexium 32A

1-phase

LXM32AD18M2

Wiring diagram holding brake



Servo Drive **Lexium 32A** 1-phase **LXM32AD18M2** Parallel connection DC bus	
Servo Drive **Lexium 32A** 1-phase **LXM32AD18M2** Connecting the external braking resistor	

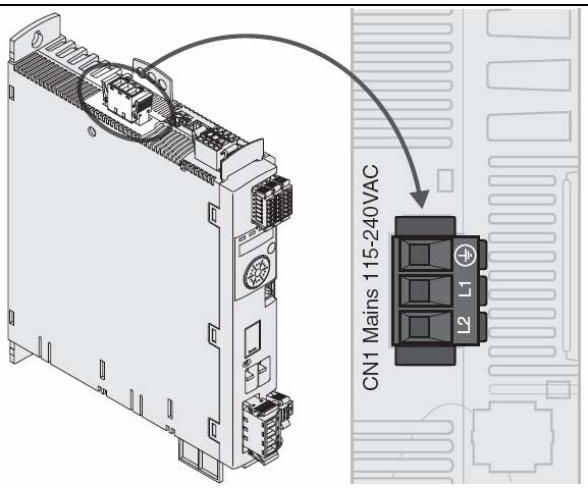
Servo Drive

Lexium 32A

1-phase

LXM32AD18M2

Wiring diagram power stage supply voltage for 1-phase device



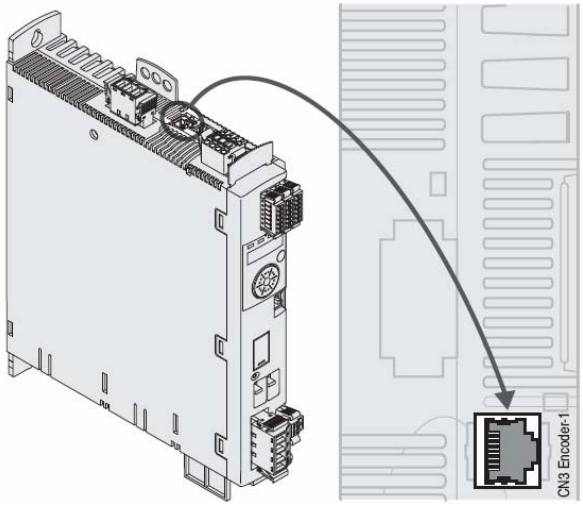
Servo Drive

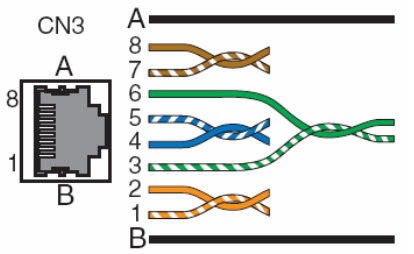
Lexium 32A

1-phase

LXM32AD18M2

Wiring diagram motor encoder





Pin	Signal	Motor, pin	Pair	Meaning	I/O
1	COS+	9	2	Cosine signal	I
2	REFCOS	5	2	Reference for cosine signal	I
3	SIN+	8	3	Sine signal	I
6	REFSIN	4	3	Reference for sine signal	I
4	Data	6	1	Receive data, transmit data	I/O
5	$\overline{\text{Data}}$	7	1	Receive data and transmit data, inverted	I/O
7	reserved		4	Not assigned	
8	reserved		4	Not assigned	
A	ENC+10V_OUT	10	5	Encoder supply	O
B	ENC_0V	11	5	Reference potential for encoder supply	
	SHLD			Shield	

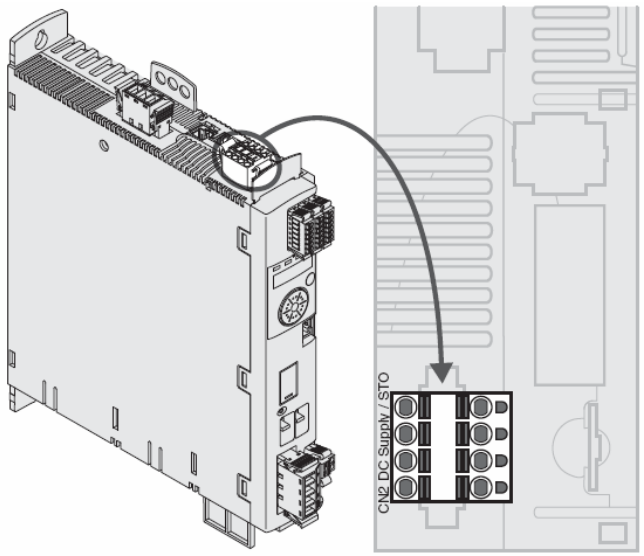
Servo Drive

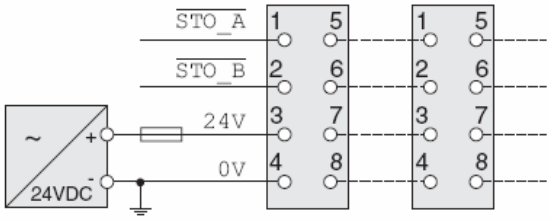
Lexium 32A

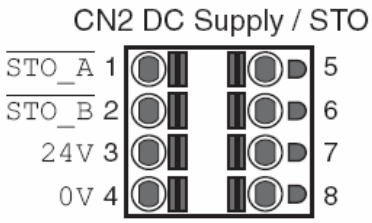
1-phase

LXM32AD18M2

Wiring diagram controller supply voltage







Pin	Signal	Meaning
1, 5	STO_A	Safety function STO: Dual-channel connection, connection A
2, 6	STO_B	Safety function STO: Dual-channel connection, connection B
3, 7	+24VDC	24 V controller supply voltage
4, 8	0VDC	Reference potential for 24V controller supply voltage; Reference potential for STO

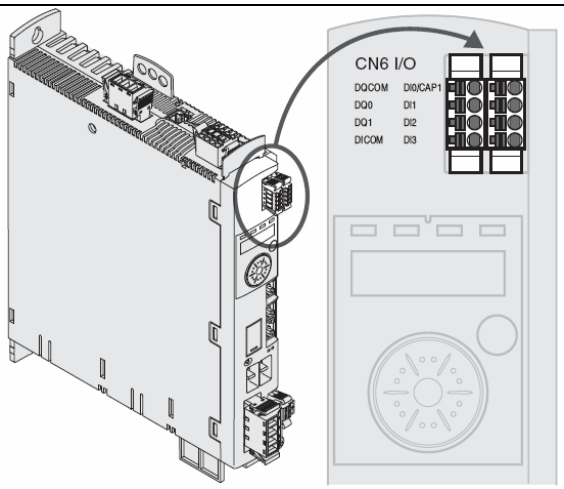
Servo Drive

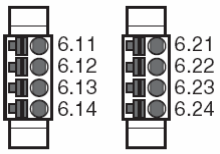
Lexium 32A

1-phase

LXM32AD18M2

Wiring diagram, digital inputs/outputs





Pin	Signal	1)	Meaning	I/O
CN6.11	DQ_COM		Reference potential digital outputs	
CN6.12	DQ0	X	Digital output 0	O (24 V)
CN6.13	DQ1	X	Digital output 1	O (24 V)
CN6.14	DI_COM		Reference potential digital inputs	

1) Connector coding, X=coding

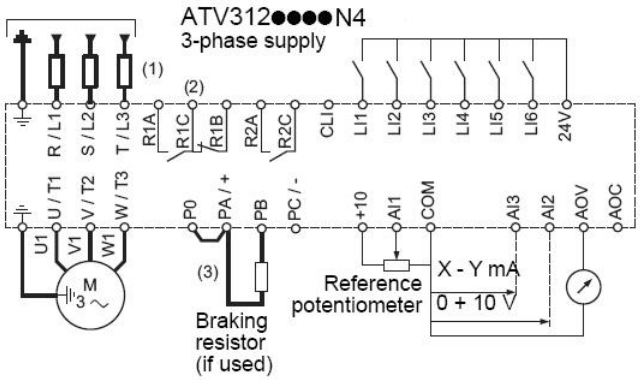
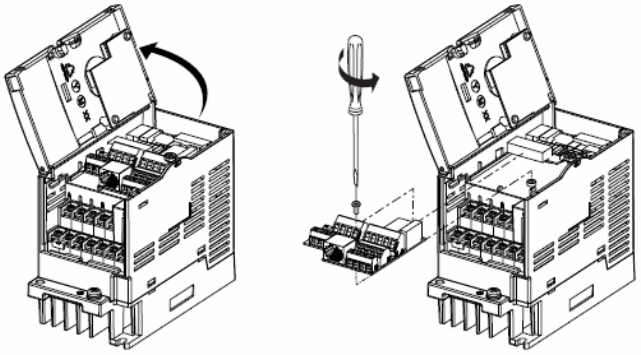
Pin	Signal	1)	Meaning	I/O
CN6.21	DI0 / CAP1	X	Digital input 0 / touch probe 0	I (24 V)
CN6.22	DI1		Digital input 1	I (24 V)
CN6.23	DI2		Digital input 2	I (24 V)
CN6.24	DI3	X	Digital input 3	I (24 V)
	DI_COM		Reference potential digital inputs: CN6.14	

1) Connector coding, X=coding

Servo motor

BMH0702T02F2A

with brake

Variable Speed Drives **Altivar 312** **ATV312H037N4** 3-phase 400 Vac, 0.37kW and **ATV312H075N4** 3-phase 400 Vac, 0.75 kW	 
Variable Speed Drive **Altivar 312** Control terminals	

Tower Light

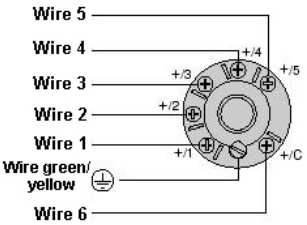
Harmony XVBC

Red Steady LED
XVBC2B4

Green Steady LED
XVBC2B3

Blue Steady LED
XVBC2B6

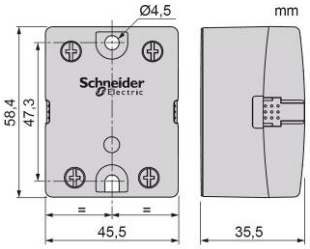
White Steady LED
XVBC2B7



Solid state relay

SSRPCDS10A1

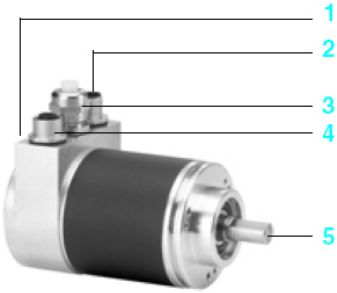
Input: 3 … 32 Vdc
Output: 24 … 280 Vac
10 A



CANopen multi-turn absolute encoder

OsiSense (Osicoder)

XCC3510PS84CB



1 2 LEDs
2 M12 male connector (CANopen incoming bus)
3 PG9 connection for supply cable
4 M12 female connector (CANopen outgoing bus)
5 Encoder shaft

Photoelectric Sensor

OsiSense

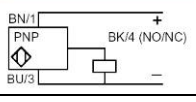
XUB1APANM12

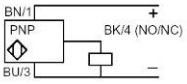
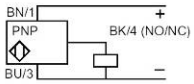
with Reflector

XUZC50

Connections

M12 connector	Pre-cabled	PNP
3 (-) 1 (+) 4 OUT/Output 2 Beam break input *(1)*	(-) BU (Blue) (+) BN (Brown) (OUT/Output) BK (Black) Beam break input *(1)* VI (Violet)	



Inductive Proximity Sensor **OsiSense** **XS608B1PAM12**	 **Connections** **M12 connector** / **Pre-cabled** / **PNP** 3 (-) 1 (+) 4 OUT/Output 2 Beam break input *(1)* (-) BU (Blue) (+) BN (Brown) (OUT/Output) BK (Black) Beam break input *(1)* VI (Violet) 
Cable for photo barriers and proximity sensor **OsiSense** **XZCP1264L2** Only 1x M12 connector for sensor: other side must be extended with connector XZCC12FDM40B	 **Connections** **M12 connector** / **Pre-cabled** / **PNP** 3 (-) 1 (+) 4 OUT/Output 2 Beam break input *(1)* (-) BU (Blue) (+) BN (Brown) (OUT/Output) BK (Black) Beam break input *(1)* VI (Violet) 
Sensor for Temperature Measurement Pt100 **PT46X150**	

Software

General

The main programming work lies in programming the Modicon M238 Logic controller, the configuration of the CANopen fieldbus and creating the screens for the HMI display.

Programming the Modicon M238 Logic controller is done using SoMachine.

Programming of the Magelis HMISTU655 is done by using Vijeo Designer which is integrated into SoMachine.

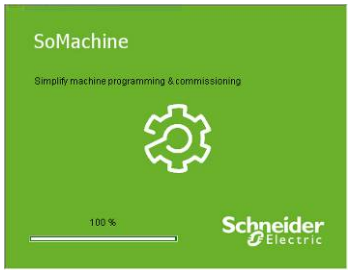
Configuration of the drives (ATV312 and LXM32A) is done using the control panel on the drive

To use the software packages, your PC must have the appropriate Microsoft Windows operating system installed:

- Windows XP Professional

The software tools have the following default install paths:

- SoMachine
  C:\Program Files\Schneider Electric\SoMachine



- Vijeo Designer
  C:\Programs\Schneider Electric\VijeoDesigner

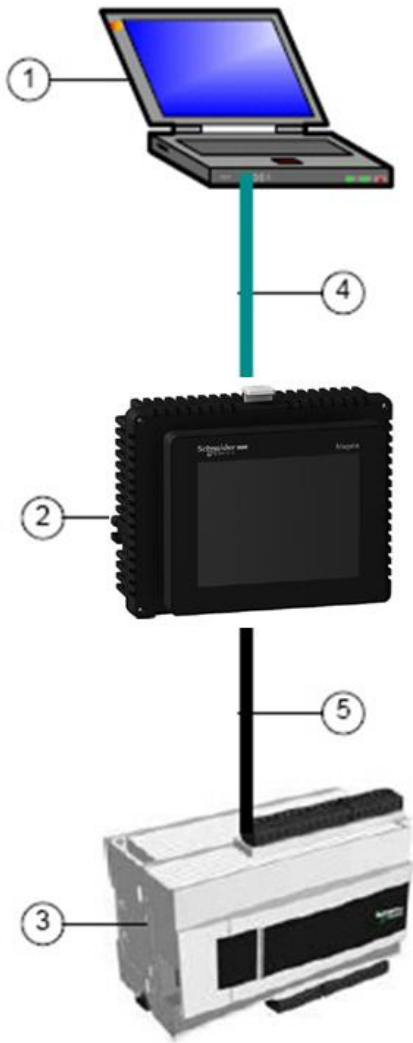
Communication

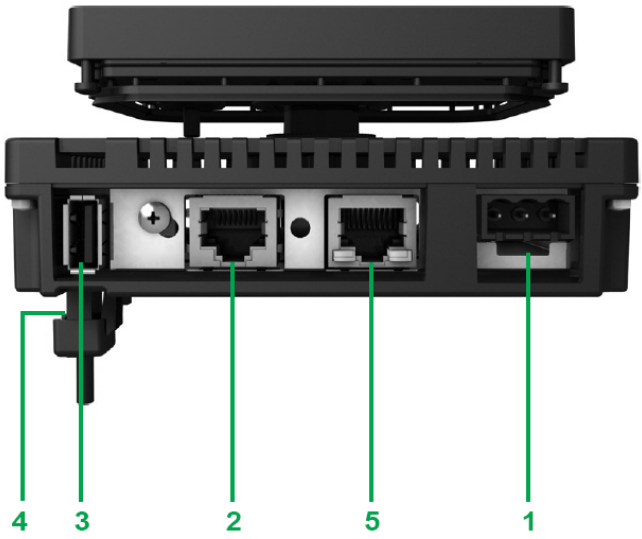
General

The TVDA architecture includes two different communication networks. The CANopen field bus connects the Modicon M238 Logic controller as CANopen Master, Altivar drives, Lexium 32A servo drives and the Osicoder as CANopen slave nodes.
All the drives are connected to the CANopen via CANopen TAPs. The CANopen transmission rate is 500 kb/s.

The Modicon M238 Logic controller and the Magelis HMISTU655 HMI communicate via SoMachine protocol. The download from the PC to the M238 and to the HMI is done using a single connection. The PC has to be connected to the HMI. Using this connection the data is also sent across to the M238.

The local control panel is used to configure the ATV312 and the LXM32A.

PC ↔ HMISTU655 ↔ M238 The download direction is from the PC to the HMI and via the HMI to the M238 **Note:** For a direct connection from the PC to the controller the **TCSXCNAMUM3P** cable can be used.	 1. PC 2. Magelis HMISTU655 3. Modicon M238 Logic controller 4. USB to USB cable **XBTZG935** 5. Serial cable VW3A8306R30

Magelis **HMISTU655** **communication ports**	 1 A removable screw terminal block for the 24 V ⎓ power supply 2 An RJ45 connector for RS 232C or RS 485 serial link connection to PLCs (COM1) 3 A USB type A host connector for: □ Connection of a peripheral device □ Connection of a USB memory stick □ Application transfer 4 A USB mini-B device connector for application transfer (on the left-hand side) 5 An RJ45 connector for the Ethernet TCP/IP 10BASE-T/100BASE-TX link
Controller ↔ HMI **VW3A8306R30 (3.0m)** Cable for connecting an HMISTU655 and an M238 Logic controller	
PC ↔ HMI PC connection cable **XBTZG935** USB cable for the connection between a SoMachine equipped PC and HMISTU655	

Altivar 312

CANopen

daisy chain option

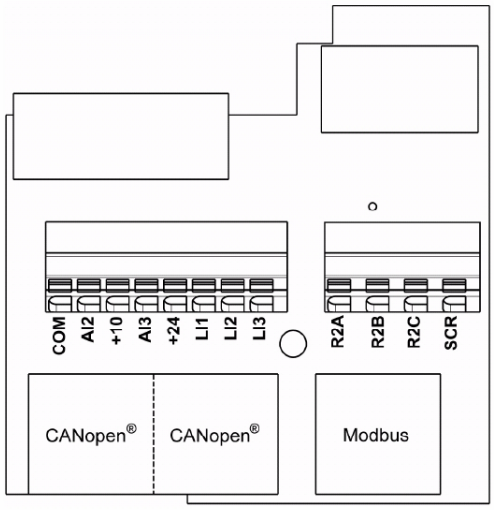
Node ID: 1, 2, 3 and 4

ATV312

CANopen

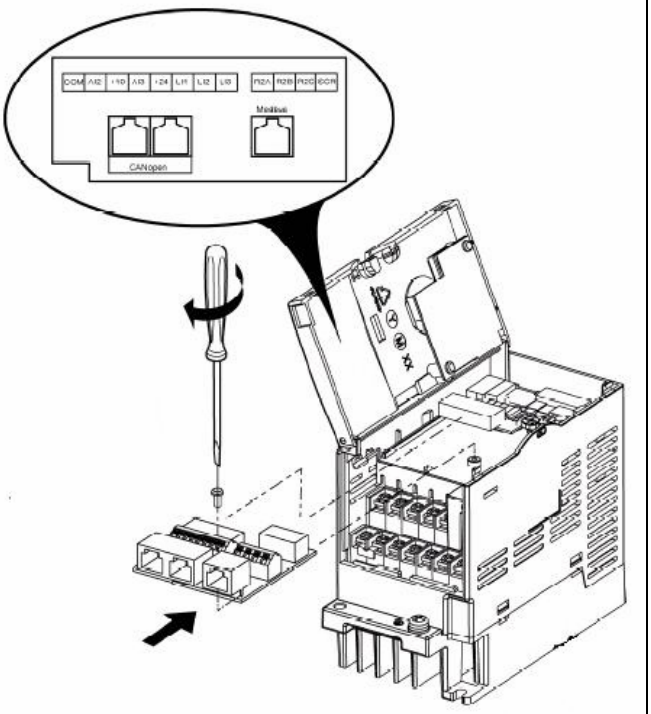
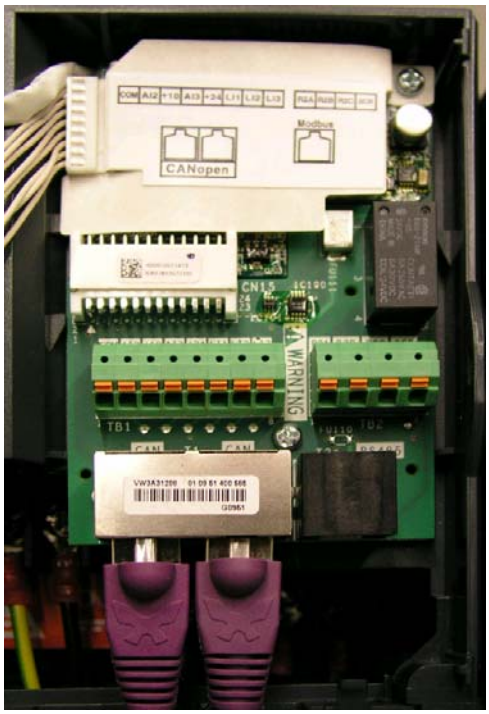
daisy chain option card

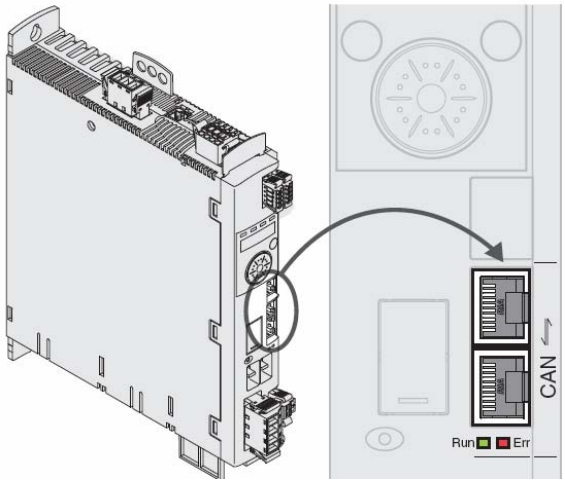
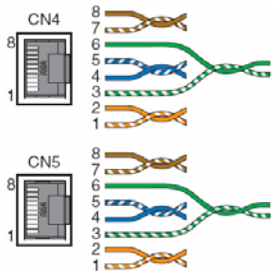
VW3A31208



Control terminals characteristics

Terminal	Function	Electrical characteristics
COM	Analog I/O common	0 V
AI2	Analog voltage input	Analog bipolar voltage input ±10 V: • Impedance 30 kΩ • maximum safe voltage 30 V
10 V	Power supply for the reference potentiometer (2.2 to 10 kΩ)	+10 V (+ 8% - 0): • 10 mA max • protected against short-circuits and overloads
AI3	Analog current input	Analog current input X-Y mA by programming X and Y from 0 to 20 mA: Impedance 250Ω
24 V	Logic input power supply	• + 24 V protected against short-circuits and overloads, min 19 V, max 30 V • Maximum customer current available 100 mA
LI1 LI2 LI3	Logic inputs	Programmable logic inputs: • Impedance 3.5 kΩ • + 24 V internal or 24 V external power supply (min. 19 V, max. 30 V) • Max. current: 100 mA • Max. sampling time: 4 ms Source position: Positive logic State 0 if < 5 V or logic input not wired, state 1 if > 11 V Sink position: Negative logic State 0 if > 19 V or logic input not wired, state 1 if < 13 V CLI position: Connection to PLC output
R2A R2B R2C	Configurable relay outputs 1 relay logic output, one "N/C" contact and one "N/O" contact with common point.	• Minimum switching capacity: 10 mA for 5 Vdc • Maximum switching capacity on resistive load (cos φ = 1 and L/R= 0 ms). 5 A for 250 Vac and 30 Vdc • Maximum switching capacity on inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 Vac and 30 Vdc • Sampling time 8 ms • Service life: 100,000 operations at maximum switching power
SCR	(Screen)	CANopen® communication shield terminal. This terminal is not connected to other circuits in this board. Ground this terminal in a location separated from the ground of power line.

ATV312 **CANopen** daisy chain option card **VW3A31208**	
ATV312 **CANopen** daisy chain option card **VW3A31208**	

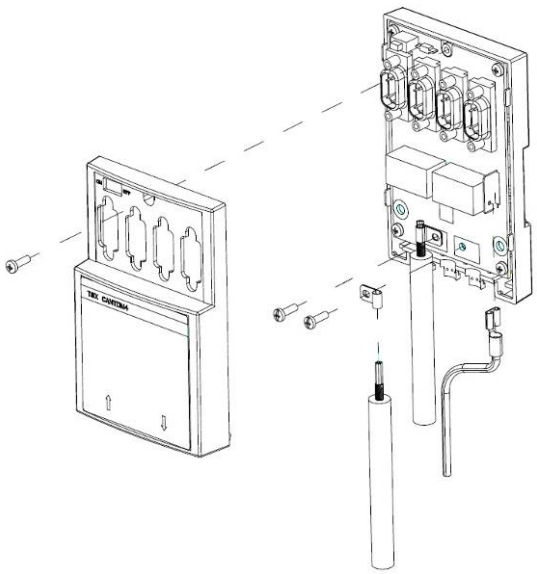
CANopen connection **Lexium 32A** **Node ID: 5 and 6**	  **Pin Signal Meaning I/O** 1. CAN_H CAN interface CAN level 2. CAN_L CAN interface CAN level 3. CAN_0V Reference potential CAN - 4. nc not used - 5. nc not used - 6. nc not used - 7. nc not used - 8. nc not used -

CANopen TAP

TSXCANTDM4

4 port CANopen junction box

For the purpose of this application, the sliding switch should be set to **OFF** if it is not at the end of the CANopen line.



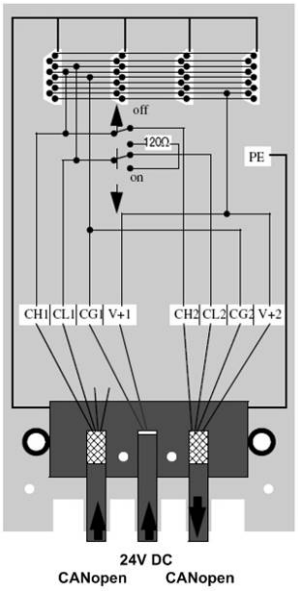
CANopen TAP

TSXCANTDM4

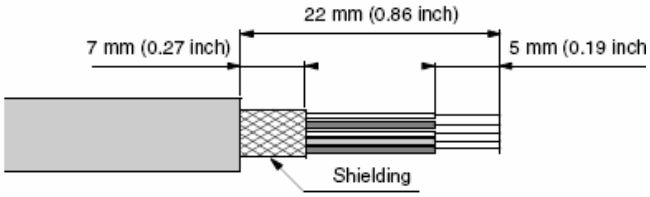
Note:
When using devices which require a 24 Vdc power supply on CANopen line (such as TeSysU) the 24 Vdc power must be wired.

Power supply:

V+1 24 Vdc
CG1 0 Vdc



Signal	Terminal block 1	Terminal block 2	Wire color
CAN_H	CH1	CH2	white
CAN_L	CL1	CL2	blue
CAN_GND	CG1	CG2	black
CAN_V+	V+1	V+2	red

CANopen preassembled connection cable **TCSCCN4F3M1T** **(length: 1.0 m)**	 Used for connection between the first ATV312 with TSXCANTDM4.
CANopen preassembled connection cable **VW3CANCARR03 (length: 0.3 m)** **VW3CANCARR1 (length: 1.0 m)**	 Used for connection between ATV312 and LXM32A (daisy chain)
CANopen cable **TSXCANCxy** The cable is available in various versions (**x**): A - Standard B - No Flame D - Heavy Duty and various lengths (**y**): 50 - for 50 m 100 - for 100 m, 300 - for 300 m.	 

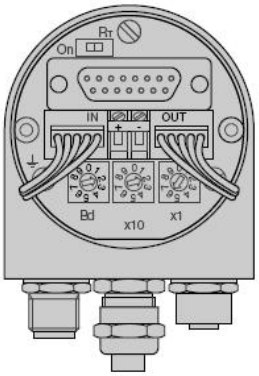
OsiSense (Osicoder)

CANopen multi-turn absolute encoder

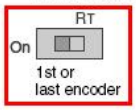
XCC3510PS84CB

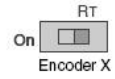
Baudrate Position 5
500 kbps

Node ID: 15

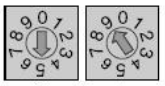


Bus termination resistor





Permissible address range



1 => 89
0 => reserved

Example: 59

Bus IN
M12 male connector

Bus OUT
M12 female connector

Pin	1	2	3	4	5
Function	CAN_SHLD	(CAN_V+)	CAN_GND	CAN_H	CAN_L

Terminal	+	–
Function	24 V	0 V

The following baud rates are possible:

Speed (kbaud)	Position of encoder rotary switch
10	0
20	1
50	2
125	3
250	4
500	5
800	6
1000	7
Reserved	8
Default (250)	9

Implementation

Introduction

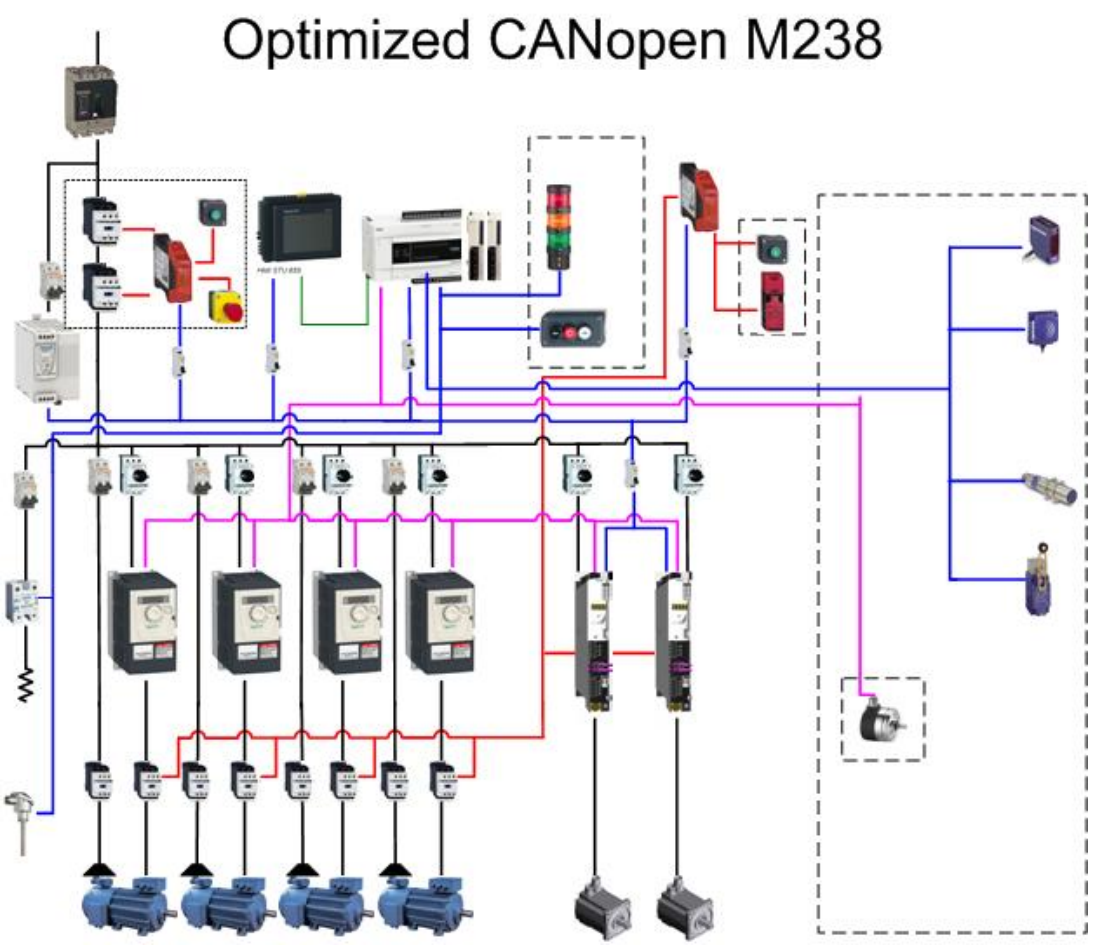
The implementation chapter describes all the steps necessary to initialize, to configure, to program and start-up the system to achieve the application functions as listed below.

Function

Start up and functional description

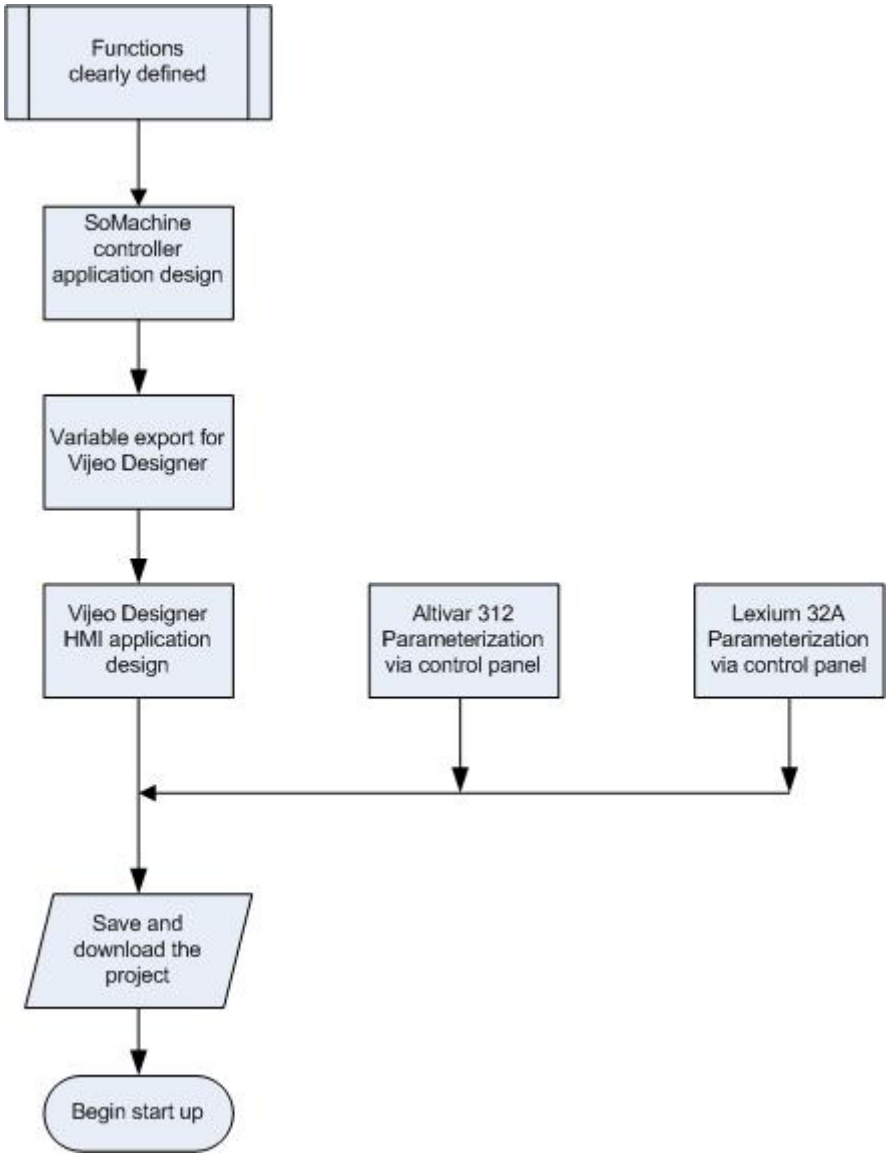
1. Ensure all motor circuit breakers and Multi9 circuit breakers are in the ON position.
2. Ensure that the main switch is in the ON position.
3. Press the "ACKN E-STOP" blue illuminated pushbutton on the main cabinet door to acknowledge the system is energized. The blue illuminated pushbutton will turn OFF if the system is energized.
4. Ensure that all machine interlocks are engaged (i.e. the door guard switches)
5. Press the "ACKN DOOR-READY" blue illuminated pushbutton on the main cabinet door to acknowledge the system is ready for operation. The blue illuminated pushbutton will turn OFF if the system is ready for operation.
6. Use Magelis HMISTU655 to control/monitor the system.
    a. The “BUS”, “ALARMS”, “SAFETY” screens can be used to monitor the network, system status and alarm messages.
    b. The “ATV312” screen can be used to control/monitor Altivar 312 variable speed drives.
    c. The “LXM32” screen can be used to control/monitor Lexium 32 servo drives.

Functional Layout



Course of Action

Flow chart showing the implementation procedure



Communication

Introduction

This chapter describes the data passed via the communications field bus and network (e.g. CANopen or Ethernet) that are not bound directly with digital or analog hardware.

The list contains:

- The device links
- Direction of data flow
- Symbolic name and
- Bus address of the device concerned.

Device Links

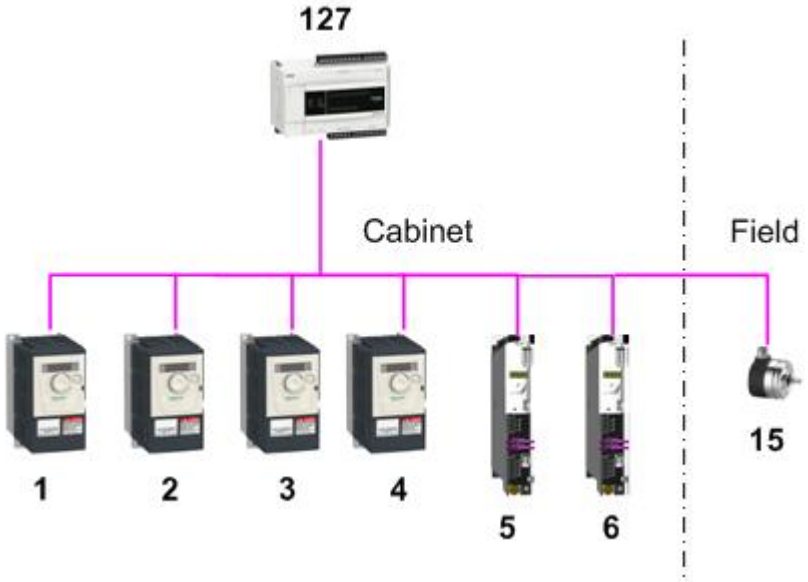
This application uses CANopen fieldbus.

CANopen connects the following devices:
1 Modicon M238 Logic Controller on bus address 127
4 Altivar 312 variable speed drives, bus addresses 1, 2, 3 and 4
2 Lexium 32A servo drives, bus addresses 5 and 6
1 OsiSense (Osicoder) CANopen encoder, bus address 15

The used CANopen Baudrate is 500kBit/s

The SoMachine protocol over serial port (RS485) connects:
Magelis HMISTU655
Modicon M238 Logic controller

CANopen nodes



NOTE For the data exchange between the controller and the Lexium 32A and the Altivar 312, PLCopen function blocks are used. It is not necessary to configure the data exchange manually.

Datalink **Osicoder_Node 15 <> M238**	**M238***(CANopen-Master, #127)*	**Osicoder** *(CANopen-Slave #15)*
	Data Direction Osicoder -> M238	
	Name	**Designation**
	udiEncoPosL	Actual encoder value

Controller

Introduction

The Controller chapter describes the steps required for the initialization and configuration and the source program required to fulfill the functions.

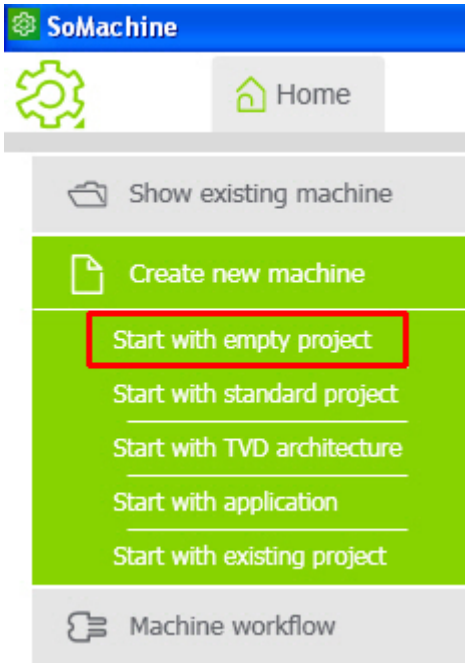
Requirements

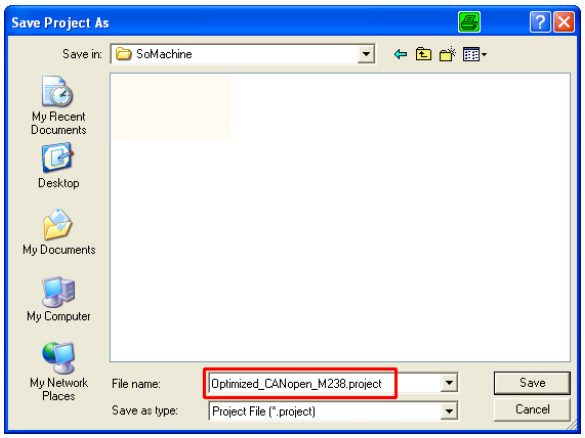
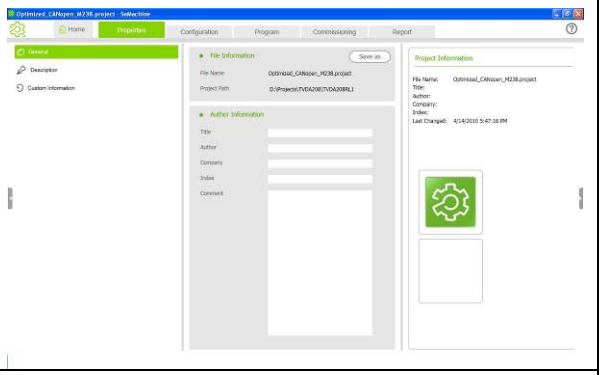
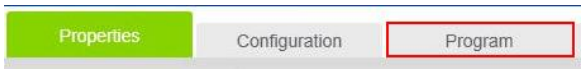
- SoMachine is installed on your PC
- The Modicon M238 Logic controller is switched on and running
- The M238 is connected to the HMI with the programming cable
- The HMI is connected to the PC via the cable XBTZG935 (HMI to PC)

Setting up the M238 is done as follows:

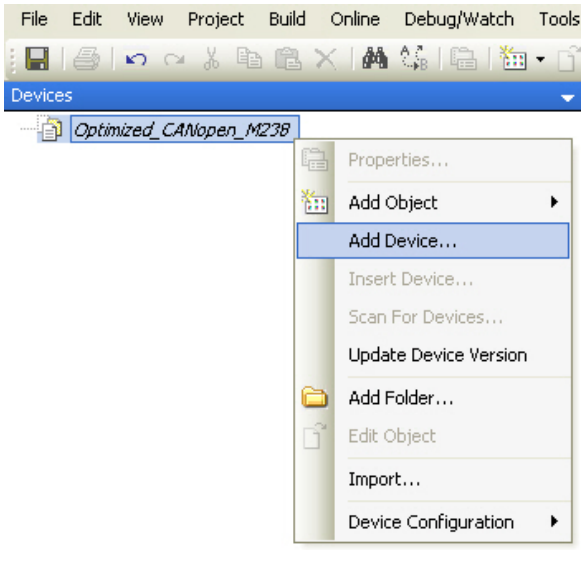
- Create a new Project
- Add the controller
- Add Expansion Cards
- Add the CANopen fieldbus
- Add CANopen devices
- ATV312 CANopen configuration
- LXM32 CANopen configuration
- OsiSense (Osicoder) CANopen configuration
- Add POU
- Task configuration
- Add Vijeo Designer HMI
- Configure controller ↔ HMI data exchange
- Communication setting Controller ↔ PC
- Communication setting PC ↔ HMI
- Save the Project
- Build Application
- Download the controller and HMI program
- Login to the controller
- Application overview

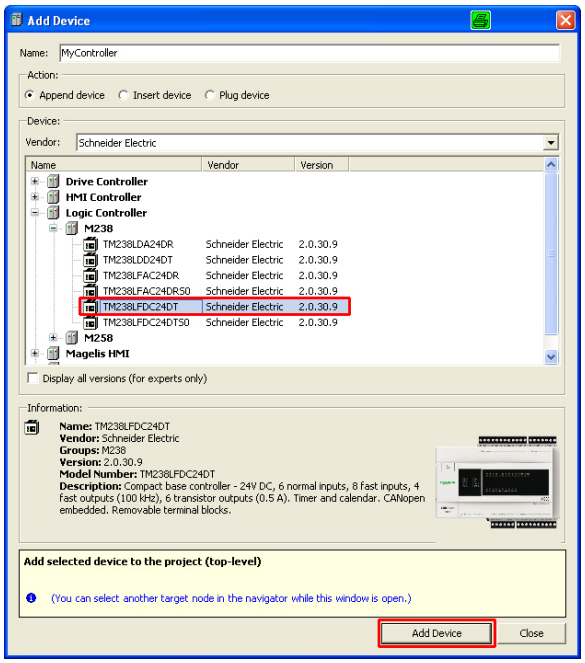
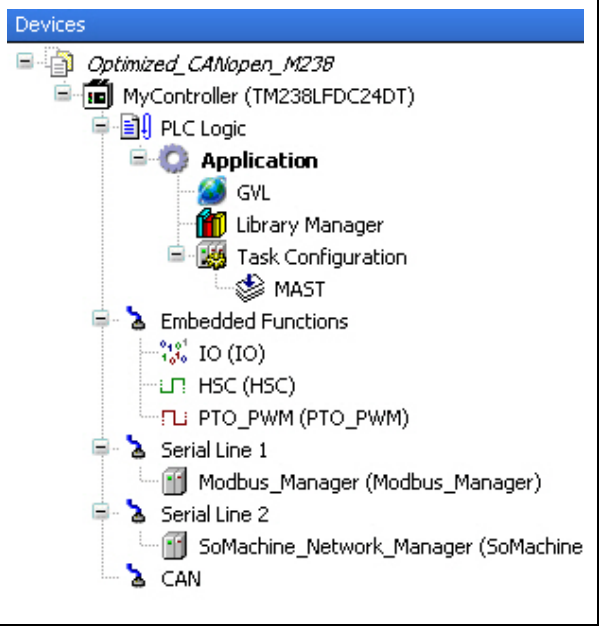
Create a new Project

1	To create a new project select **Create new machine→ Start with empty project**	

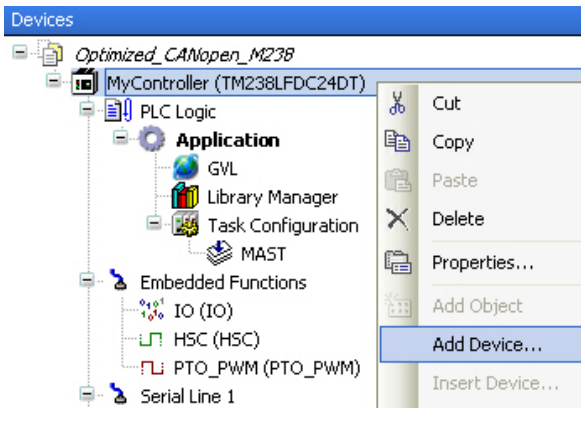
2	In the **Save Project As** dialog enter a **File name** and click on **Save.** **Note:** As a default the project is saved under **My Documents**.	
3	The SoMachine User Interface opens.	
4	Select the **Program** tab	

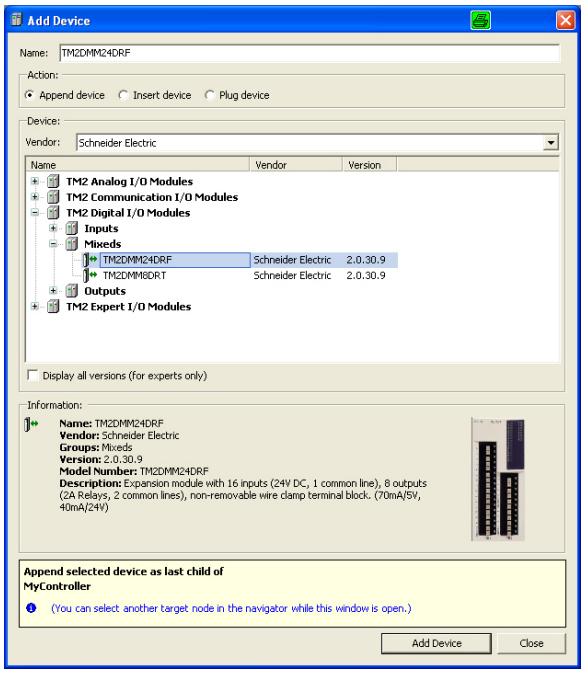
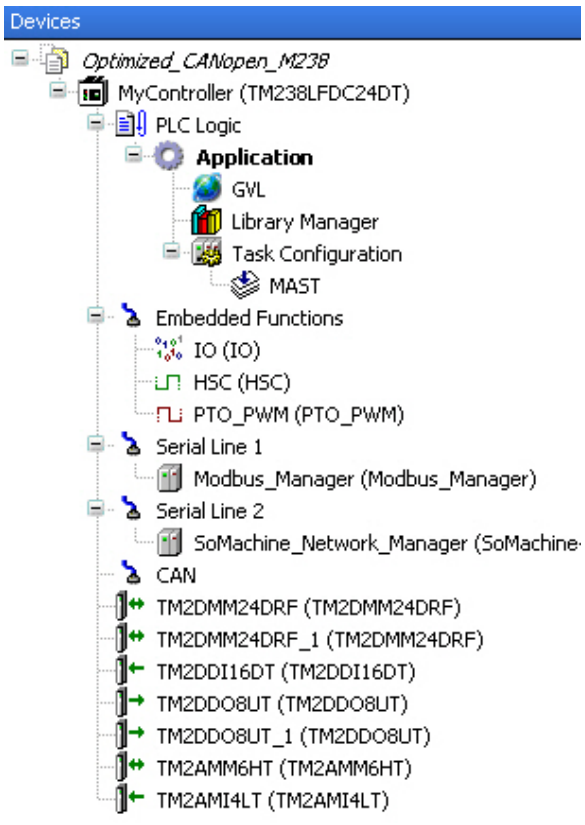
Add the Controller

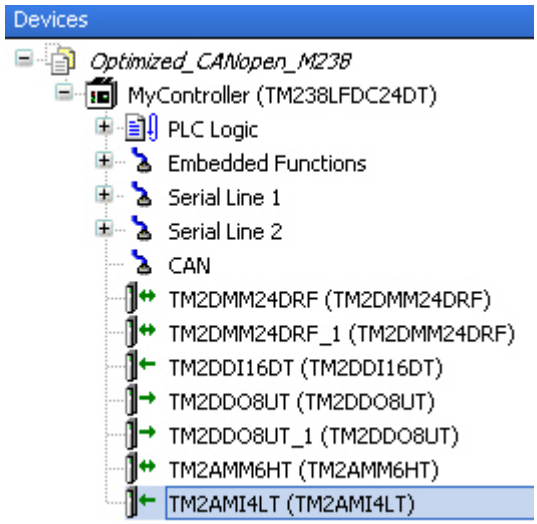
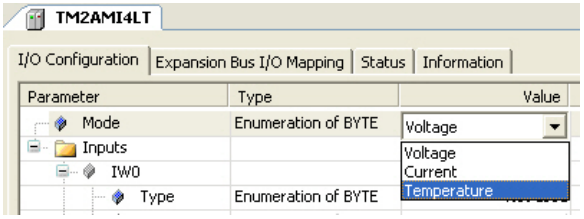
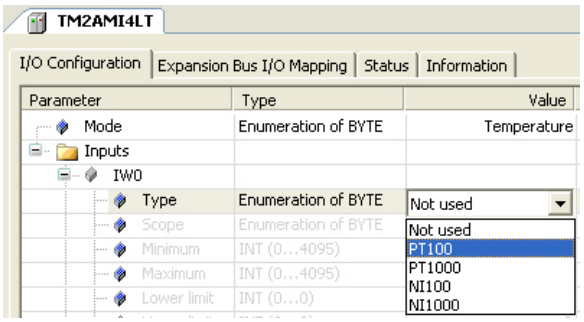
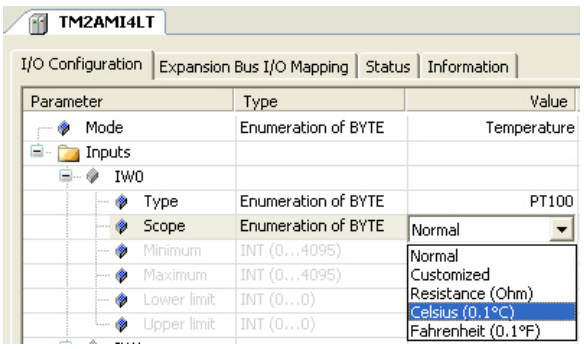
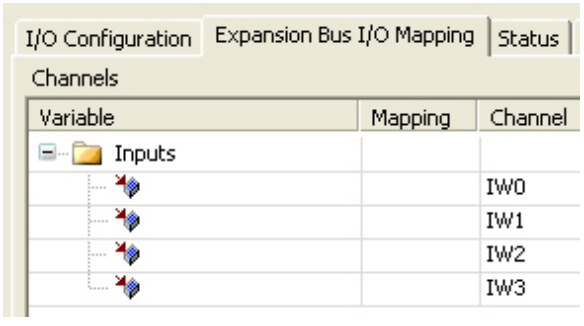
1	Right click on: **Optimized_CANopen_M238** Select **Add Device…** in the pop-up menu.	

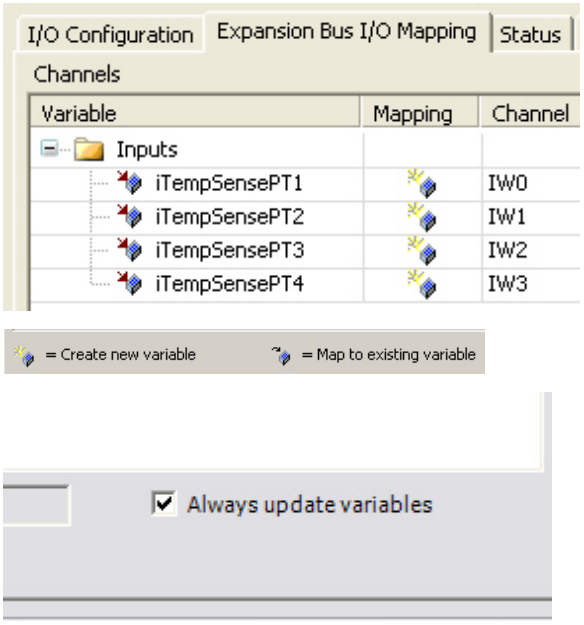
2	Select **Schneider Electric** as **Vendor**. Then select: **Logic Controller ->** **M238 ->** **TM238LFDC24DT** as **Device**. Click on **Add Device** and then **Close.**	
3	The **Devices** browser now displays the new controller.	

Add Expansion Cards

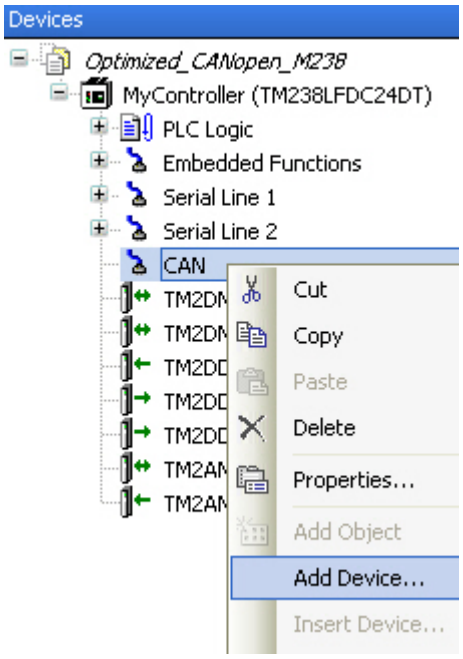
1	To add an expansion card, right click on **MyController (TM238LFDC24DT)** and click on **Add Device...**	

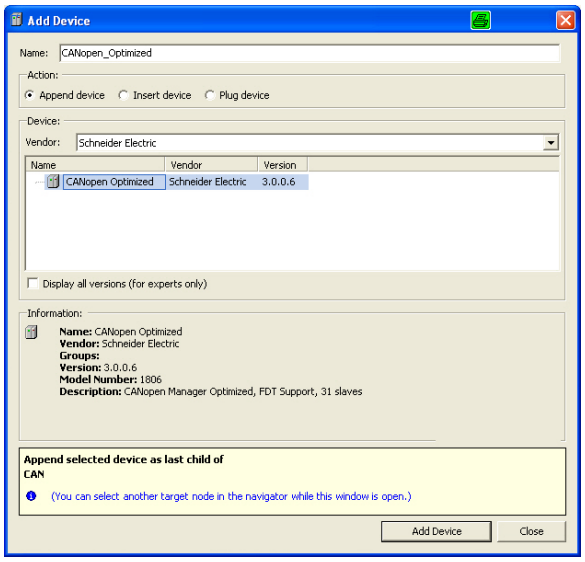
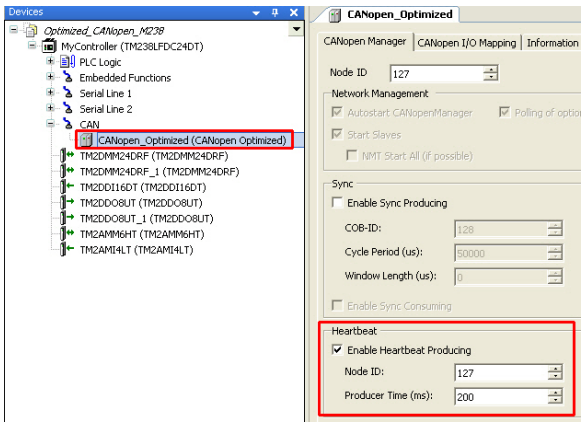
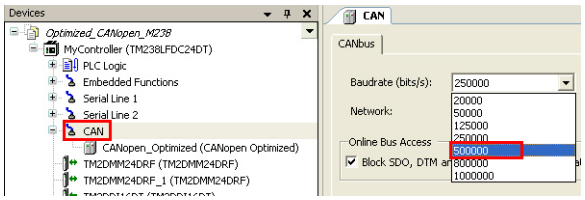
2	Select the expansion card and click on **Add Device** For this project add the following cards: **2x TM2DMM24DRF** **1x TM2DDI16DT** **2x TM2DDO8UT** **1x TM2AMM6HT** **1x TM2AMI4LT** Once you have added all the cards close the dialog with **Close**.	
3	The added expansion cards can now be seen at the end of the device list.	

4	To edit an expansion card, click on it. Here we will edit the Pt100 expansion card **TM2AMI4LT**	
5	Select the **I/O Configuration** tab and change the **Value** of the **Enumeration of BYTE** for **Mode** of the **IW0** to **Temperature**.	
6	Then the **Enumeration of BYTE** for **Type** to **PT100** and the **Enumeration of BYTE** for **Scope** to **Celsius (0.1°C)**	 
7	On the **Extension Bus I/O Mapping** tab it is possible to map the data of **IW0, IW1, IW2 and IW3** to variables.	

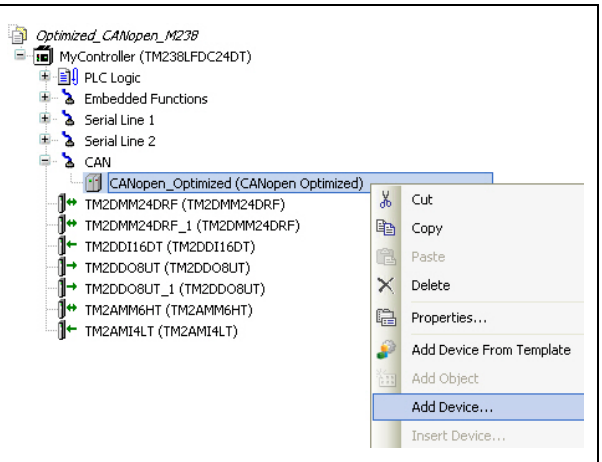
8	There are two ways of **Mapping:** 1.Mapping to an existing variable 2.Create a new variable For this data **Create a new variable** was chosen. This method allows SoMachine to create a global variable which can be used throughout the whole program. The names of the variables can be entered in the **Variable** field. To update the variables with the newest I/O data check **Always update variables.**	

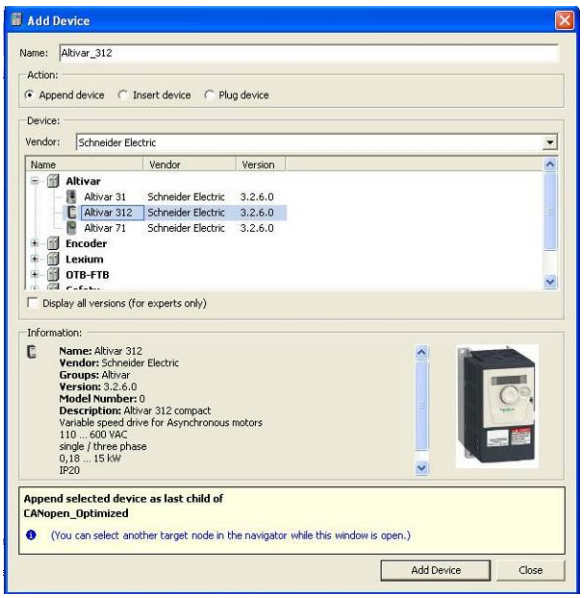
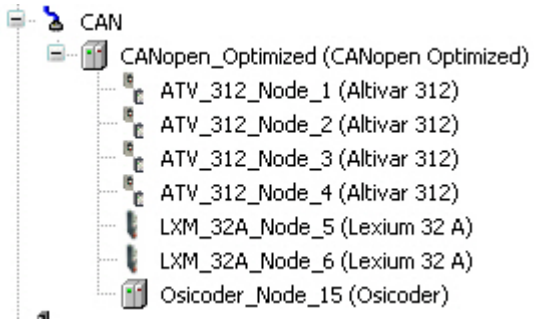
Add the CANopen fieldbus

1	Right click on **CAN** and select: **Add Device...**	

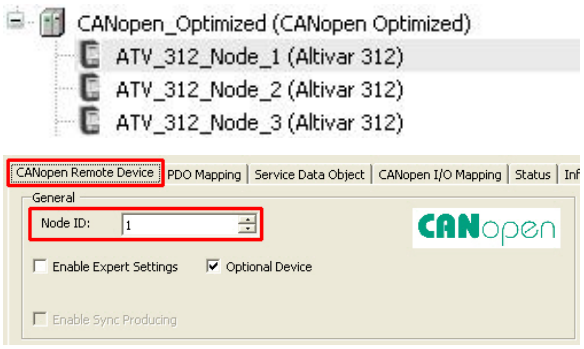
2	Select: **CANopen_Optimized** Click on **Add Device**	
3	To activate the **Heartbeat** of the M238 double click the **CANopen_Optimized** and check **Enable heartbeat generation.** The **Heartbeat time** is **200 ms.**	
4	To set the **Baudrate** of the CANopen bus, double click on **CAN** and select **500000** as a **Baudrate (bits/s).**	

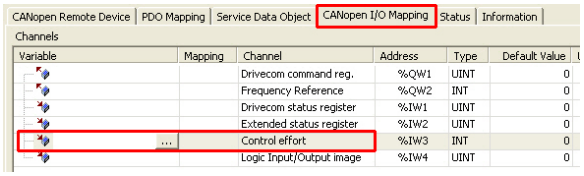
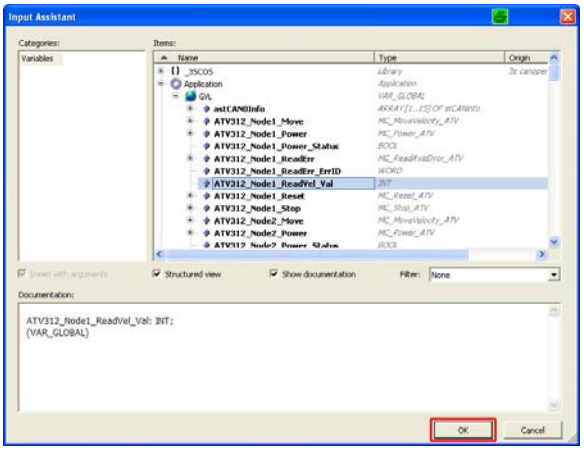
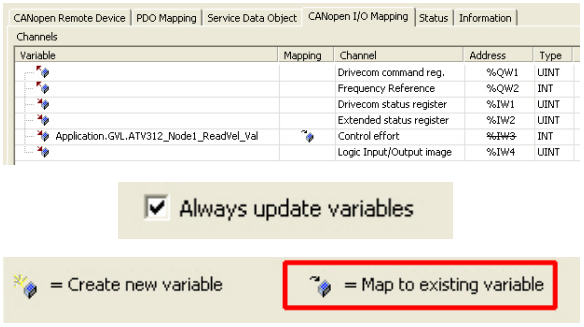
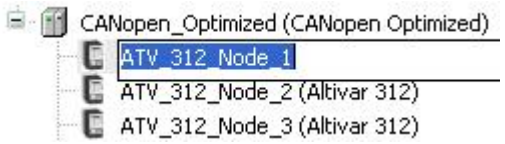
Add CANopen Devices

1	Right click on the **CANopen_Optimized** and select **Add Device…** in the pop-up menu.	

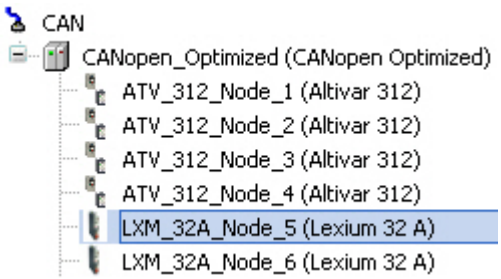
2	Select the device that you wish to connect to the CANopen bus. In this project the following devices are connected to the CANopen bus: **4x Altivar 312** **2x Lexium 32A** **1x Osicoder** Add each device by clicking on **Add Device**. Once you have added all devices click on **Close.** **Note:** The name of the device can be changed under **Name.**	
3	The new devices are now listed in **CANopen_Optimized**. To configure the devices, double click on the specific item. **The name of each device can be changed**.	

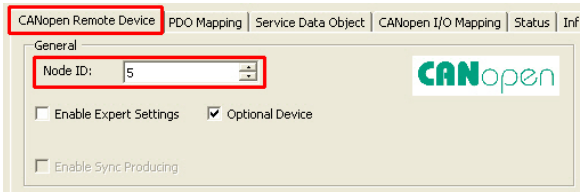
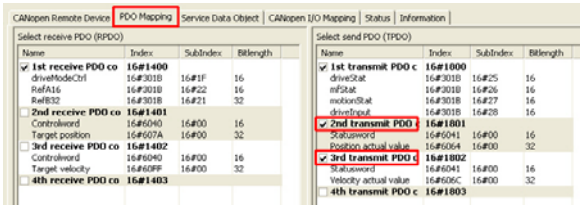
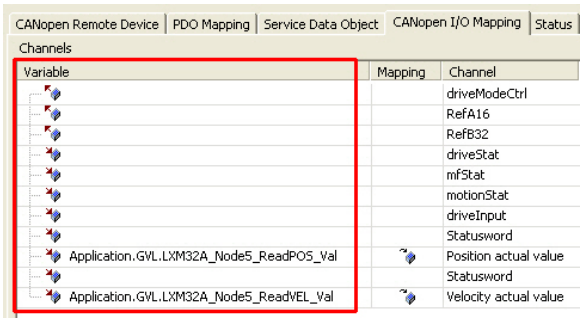
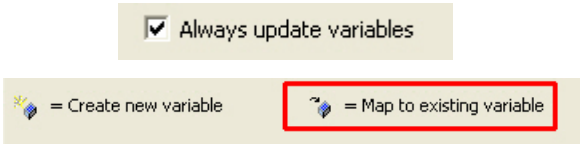
ATV312 CANopen configuration

1	Double click on the **ATV_312_Node_1** **Note:** In this project all PDO settings remain at their defaults. Set the **Node ID** to **1** (for the second ATV to 2, third ATV to 3, and forth to 4).	

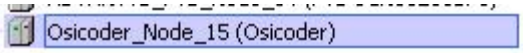
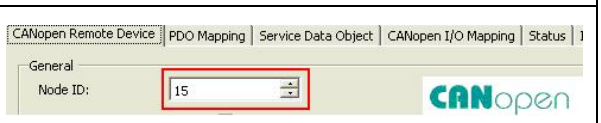
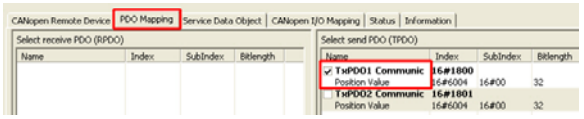
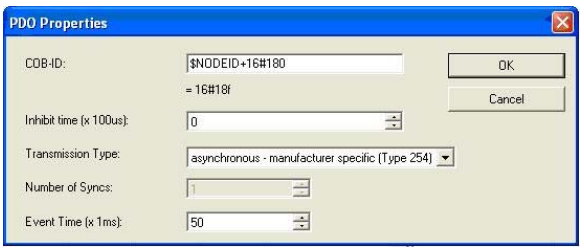
2	On the **CANopen I/O Mapping** tab it is possible to map the data to variables There are two ways of **Mapping:** 1.Mapping to an existing variable 2.Create a new variable For this data **Map to existing varibale** was chosen. The names of the variables can be selected with the **Input Assistant** and press **OK**. Here the variable of the actual velocity of the ATV is chosen.	 
3	To update the variables with the newest I/O data check **Always update variables.**	
4	To change the name of the CANopen device, click on the old name. **Note:** The name of the device is also the AXIS REF name for the PLCopen functions used in the application program	

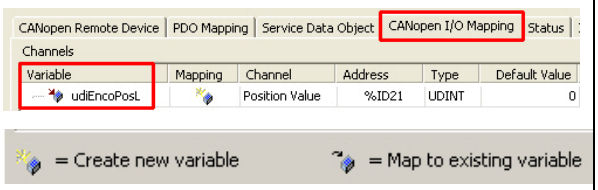
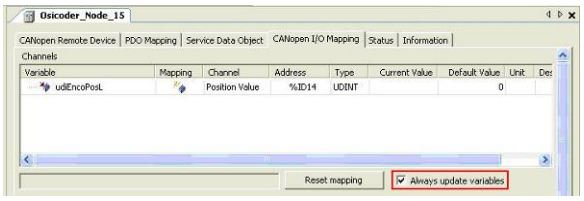
LXM32 CANopen configuration

1	Double click on the **LXM_32A_Node_5**	

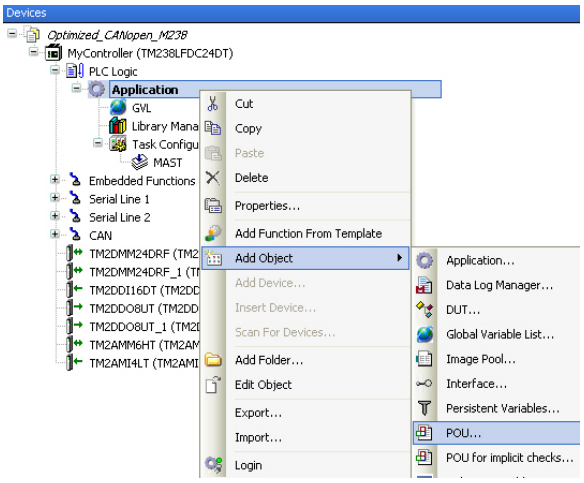
2	Set the **Node ID** to **5** (for the second LXM to 6).	
3	On the **PTO Mapping** tab it is possible to add PTOs for additional data. Check **2nd transmit PDO** and **3rd transmit PDO** Here includes the actual position and actual velocity of the LXM.	
4	Then on the **CANopen I/O Mapping** tab map the data to existing variables.	
5	To update the variables with the newest I/O data check **Always update variables.**	

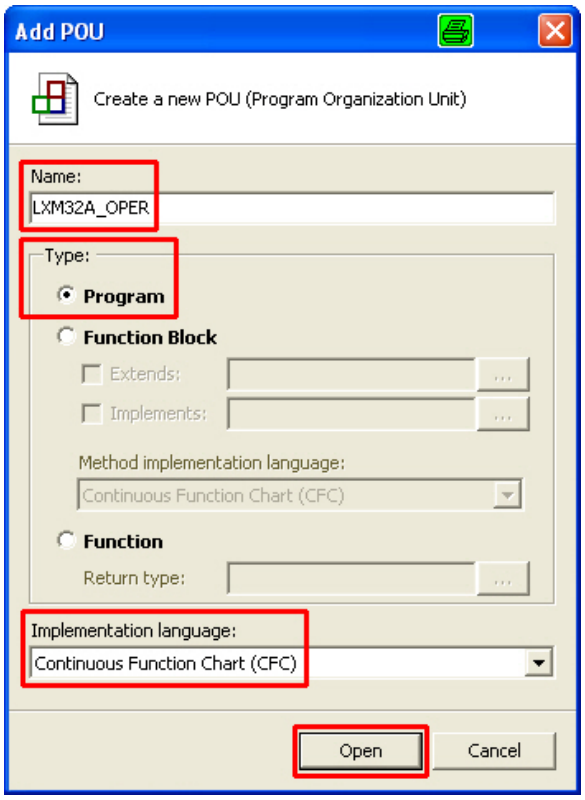
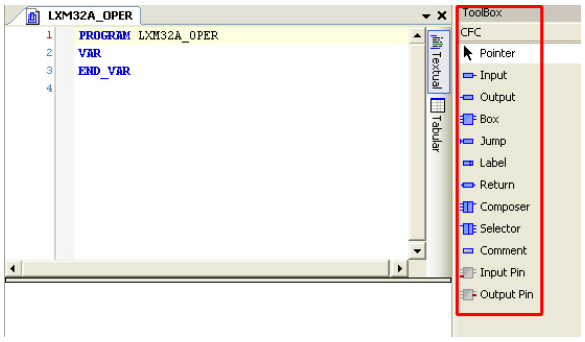
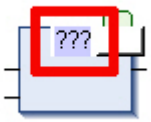
Osicoder CANopen configuration

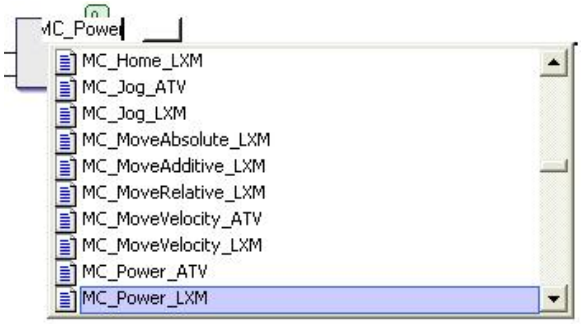
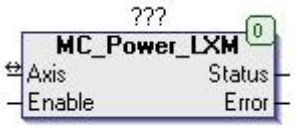
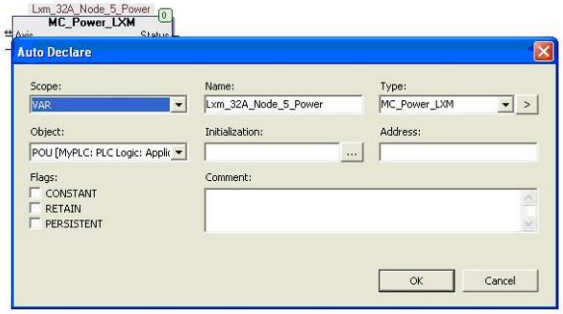
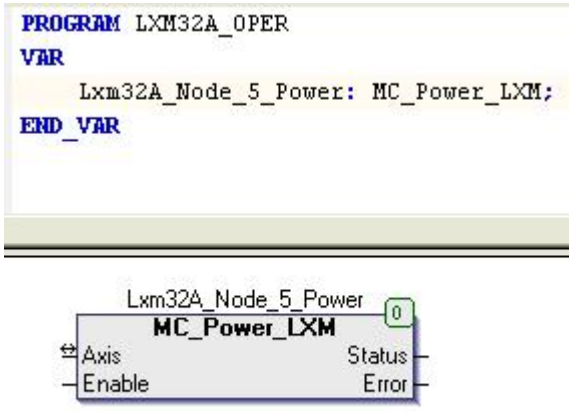
1	To configure the Osicoder double click on **Osicoder_Node_15**.	
2	Select **Node ID 15**	
3	Go to the **PDO Mapping** tab and double click the **TxPDO1**	
4	Set the **Event Time** to a value greater 0. In this project it is **50 ms.** If the value is 0, the Osicoder will not send any data.	

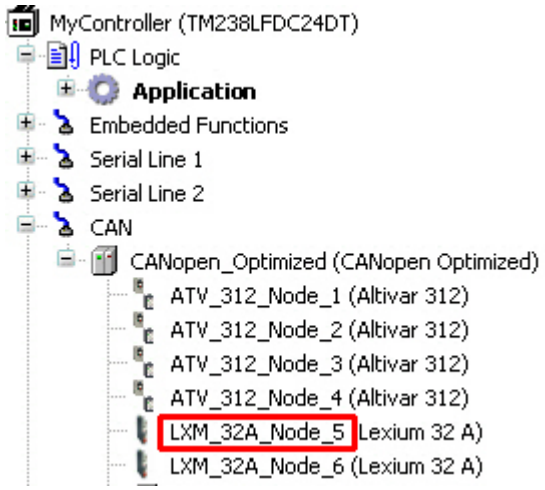
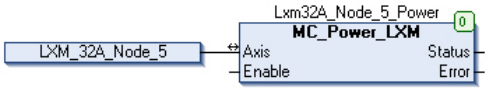
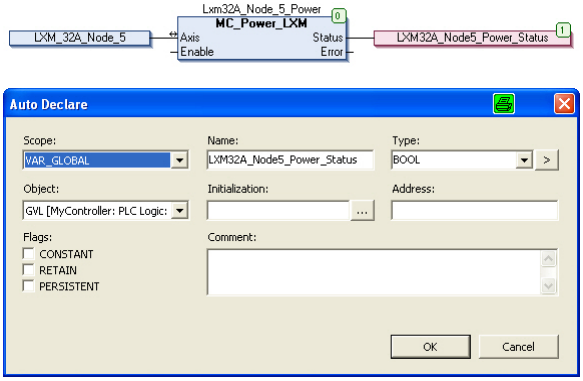
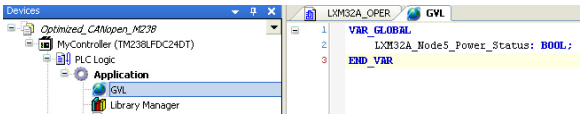
5	In the **CANopen I/O Mapping** tab, the Osicoder input is mapped to a variable. There are two ways of **Mapping:** 1.Mapping to an existing variable 2.Creating a new variable For this data **create a new variable** was selected. This method allows SoMachine create a global variable which can be used throughout the whole program. The names of the variables can be entered in the **Variable** field.	
6	Click on the **CANopen I/O Mapping** tab and check **Always Update variables.**	

Add a POU

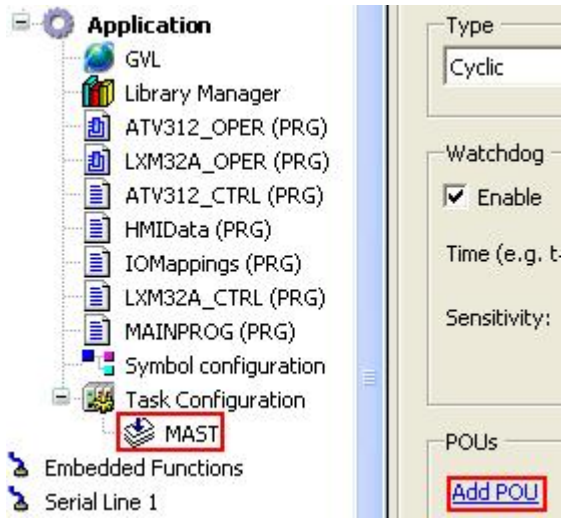
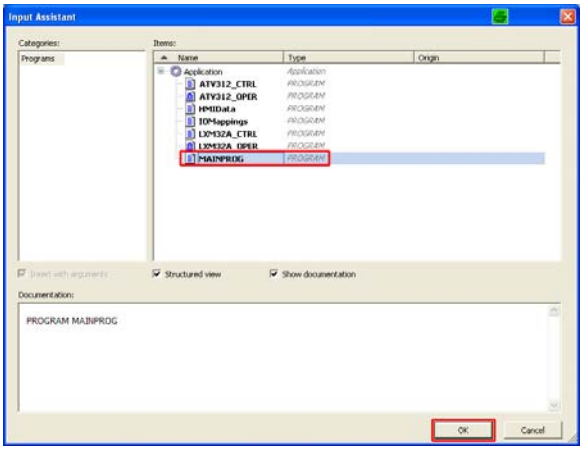
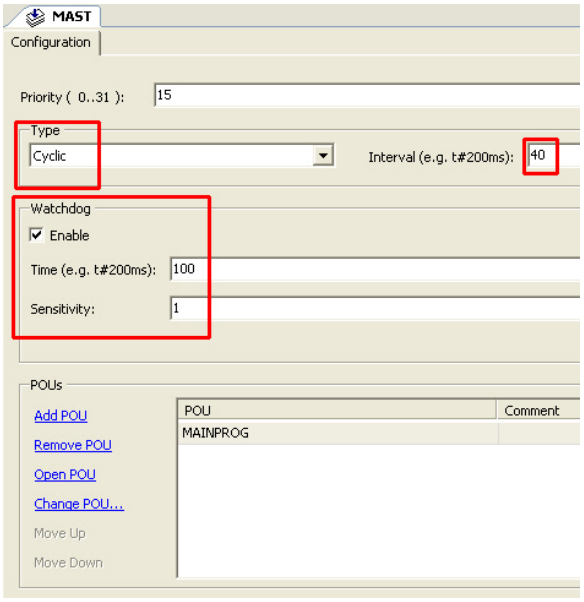
1	In the project browser, right click on: **Application→** **Add Object →** **POU…**	

2	Enter a **Name.** As **Type** select **Program** and as **Implementation language** select **CFC.** It is possible to select all the IEC languages and to generate functions and function blocks. Click on **Open.**	
3	The new POU **LXM32A_OPER** is now visible under **Application.** Double click on **LXM32A_OPER** to open it.	
4	The upper frame displays the declaration section. The lower frame is for programming. On the right side is the **ToolBox** window**.** Use drag and drop with the toolbox to place example templates in the programming section.	
5	Once you have placed a template in the programming section click on the **???**	

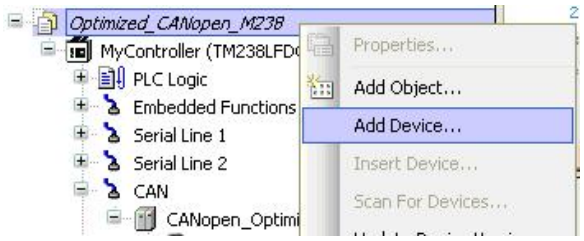
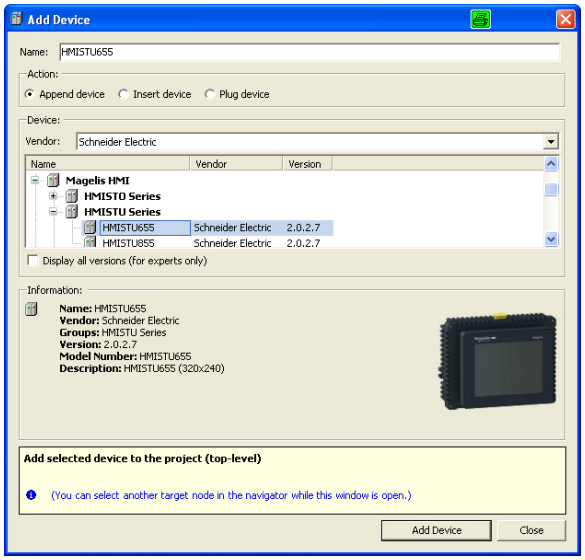
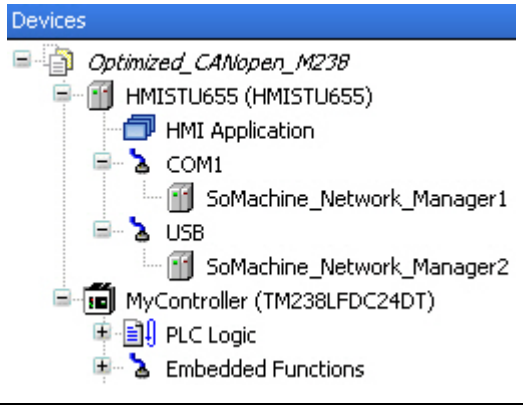
6	Type in a name for the function or function block. When the first letters are typed a pop-up menu opens with hints for the name. In this project example an MC_POWER_LXM FB was selected. The MC_POWER_LXM FB powers on the LXM32A servo drive.	
7	To instantiate the FB click the **???**	
8	… and type in a name (for example LXM_32A_Node_5_Power). Now press Enter. The **Auto Declare** dialog opens. Here click on **OK** to create the instance. **Note:** If you wish to add a comment you can do this in the Comment box**.**	
9	The new FB MC_POWER_LXM is instantiated in the declaration section of the **LXM32A_OPER**.	
10	To connect a variable to an input place an input field from the **ToolBox** on the input side of the FB and connect the input box to the FB input by clicking on the red field and dragging it to the input of the FB.	

11	The Axis name is the same as the name of the CANopen device. Here it is **LXM_32A_Node_5.**	
12	This image shows the FB with the connected input. The name of the axis can also be directly written at the input as ”LXM_32A_Node_5”	
13	Output selection is similar to input definition, but here we create a new variable. Click the output field, type in the name of the variable and press Enter. In the **Auto Declare** dialog select the **Scope**, the **Name** and the **Type.** In this example **VAR_GLOBAL** is selected as **Scope.** When finished click on **OK.**	
14	The **VAR_GLOBAL** variables are located in the **GVL** folder. All variables located in this folder can be accessed throughout the whole **Application**. If the variables are located in the POU, they can only be accessed by the POU (local variables).	

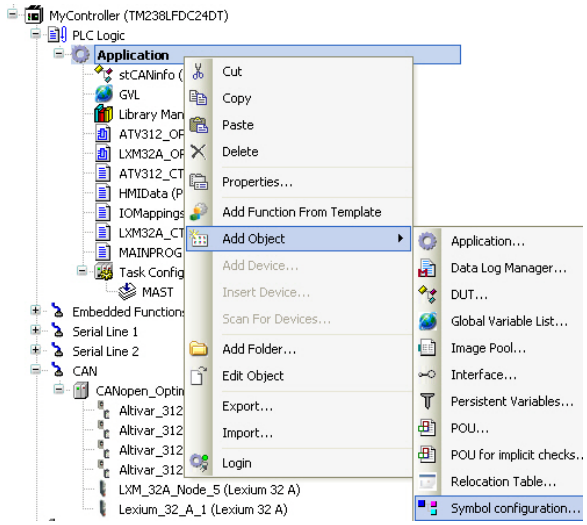
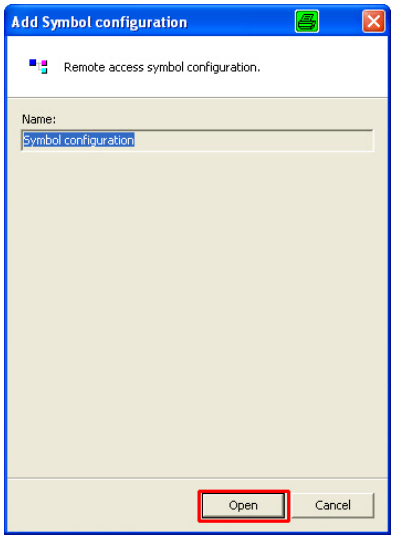
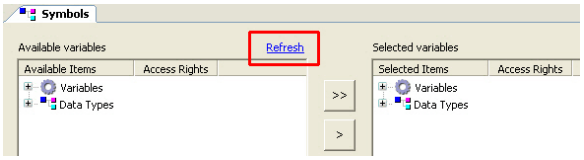
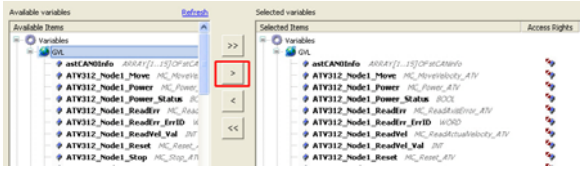
Task Configuration

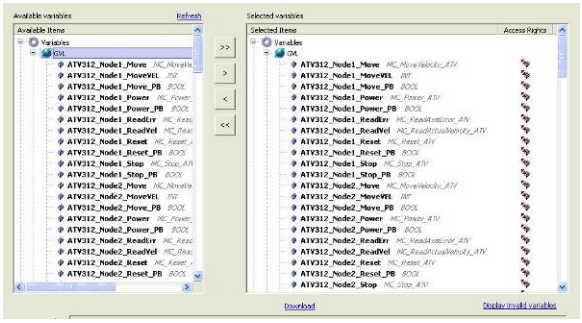
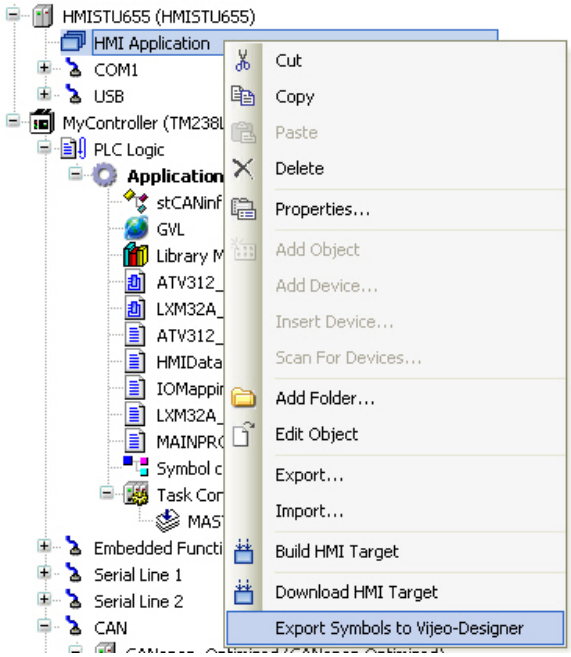
1	Before you can start working with the new POU you have to add it to a task. Here, the POUs are added to the **MAST** task. To do this double click the **MAST** task and click on **Add POU.** **Note:** If a POU is not included in a TASK, or added to another POU, which is cyclically invoked, it will not be cyclically invoked.	
2	Select **Categories Programs** and select the new POU in the **Items list.** Then click **OK**.	
3	Now the POU is in the **MAST** task. In the upper part of the **MAST** task configuration you can change the **Type** of the task. In this project it is **Cyclic** with **40ms** as the **Interval.** Direct under the **Type** menu is the **Watchdog** field. Set the Watchdog **Time** to **100ms.**	

Add Vijeo Designer HMI

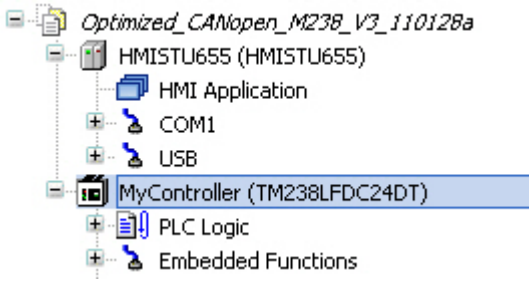
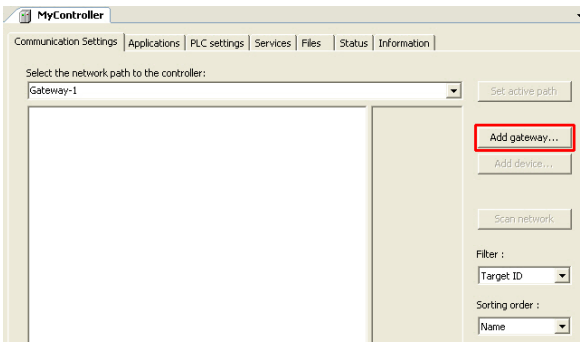
1	To add a Vijeo Designer HMI unit to the project right click on **Optimized_CANopen_M238** **→ Add Device…**	
2	In the **Add Device** dialog select **Device** and select **Schneider Electric** as **Vendor.** Click on: **Magelis HMI->** **HMISTU Series->** **HMISTU655** Click on **Add Device** and then **Close** to close the dialog.	
3	The new **HMISTU655** is now listed in the configuration. **Note:** With this **HMISTU655,** the Program Vijeo Designer opens and you can start programming. (See chapter HMI)	

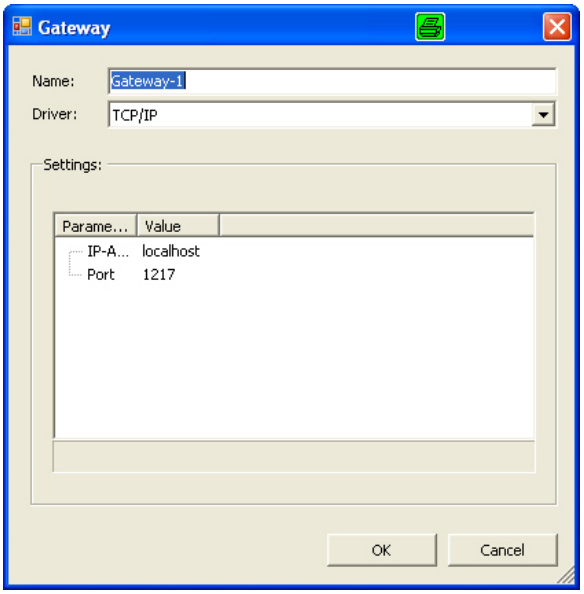
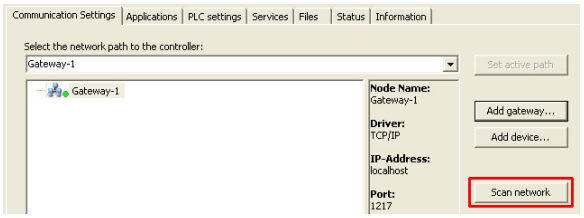
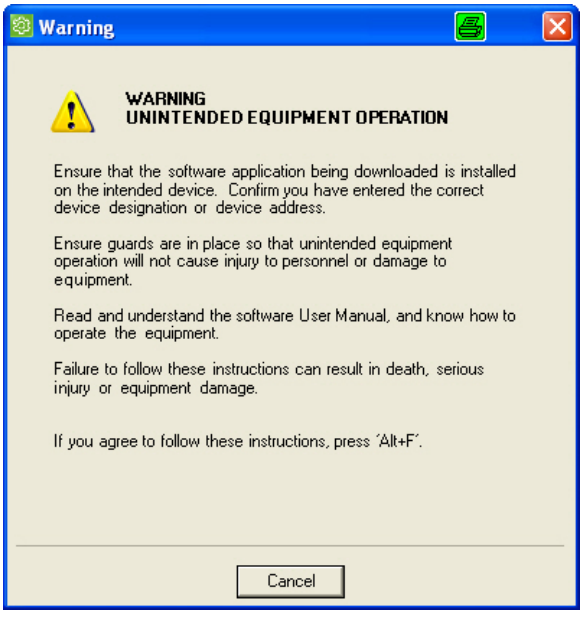
Configure Controller ↔ HMI Data Exchange

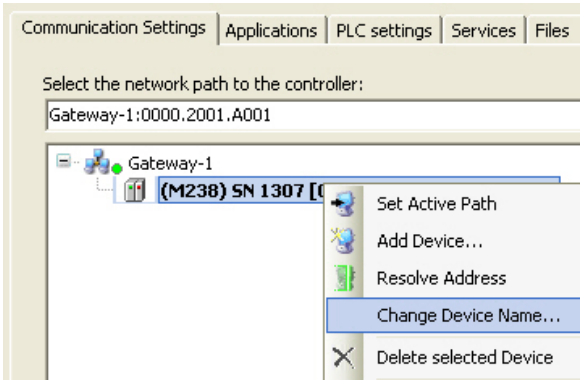
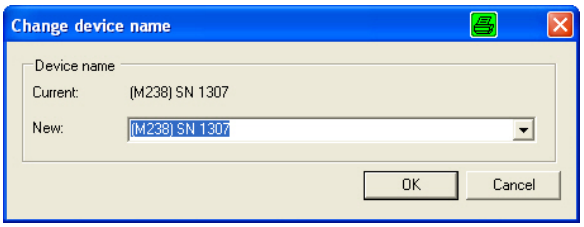
1	Right click on: **Application→** **Add Object→** **Symbol configuration…**	
2	In the **Add Symbol configuration** dialog**.** Click on **Open**.	
3	Click on **Refresh** in the now open **Symbols** window**.**	
4	All Variables created in the user program are shown in the **Available variables** list. In this project all variables are global variables and are located in the GVL folder. To export variables to the HMI, select them and click on **>**.	

5	The right frame lists the **Selected variables** which are to be used in the HMI.	
6	To export the selected variables to Vijeo Designer right click on **HMI Application** and select **Export Symbols to Vijeo-Designer.**	

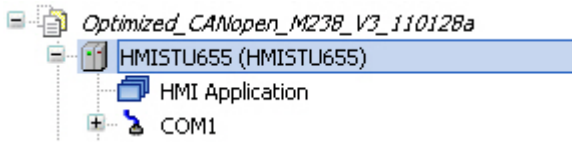
Communication setting Controller ↔PC

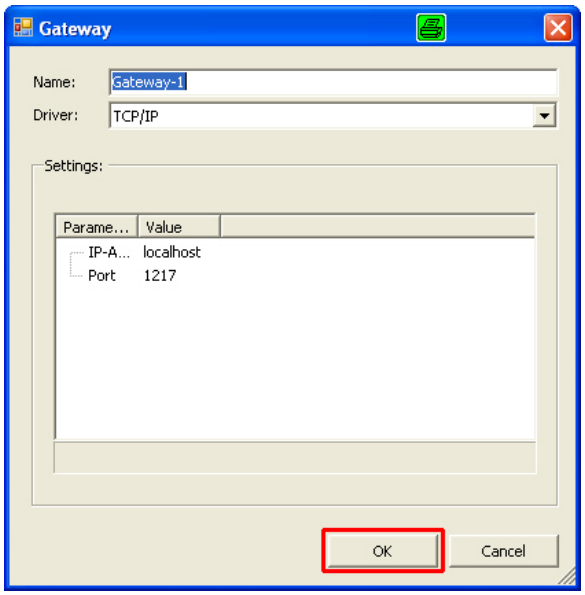
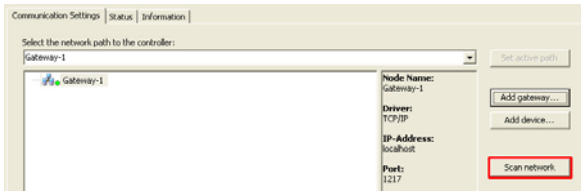
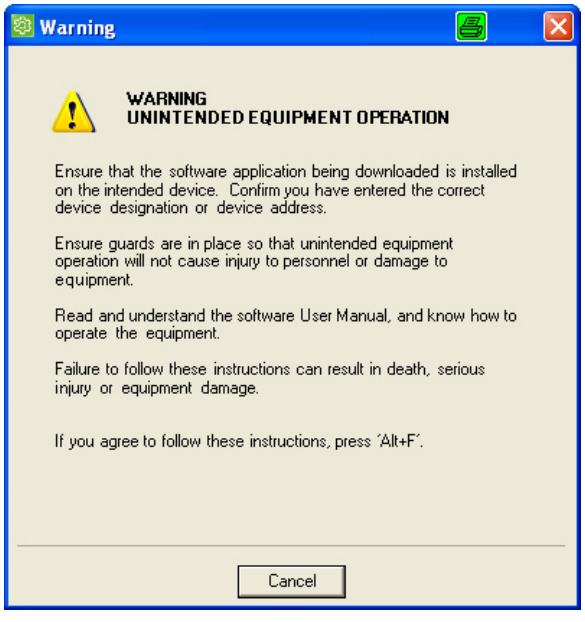
1	To configure the communication gateway double click on **MyController (TM238LFDC24DT)** in the project browser.	
2	On the **Communication Settings** tab click on: **Add gateway...**	

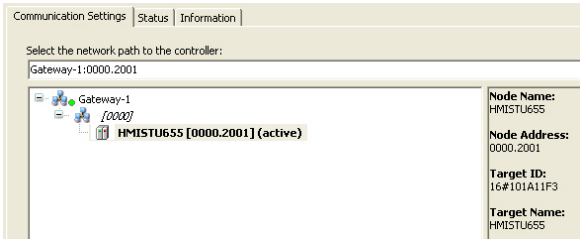
3	Keep the default settings and click on **OK.**	
4	Select **Gateway-1** and click on **Scan Network.**	
5	When the scan is finished, the devices pop up under the gateway. Select the M238 used and click **Set active path.**	
6	A hazard message pop-up window opens and the text must be read.	

7	The M238 used is now marked as **active.**	
8	**Note:** Every M238 has a unique Serial Number that is a part of the default **Device Name.** If you would like to change the default **Device Name** of your controller: right click and select **Change Device Name…** In the displayed pop-up window go to the **Device Name** field **New** and enter the new unique name for your controller. In our example we keep the factory setting name.	 

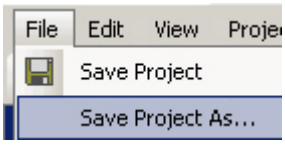
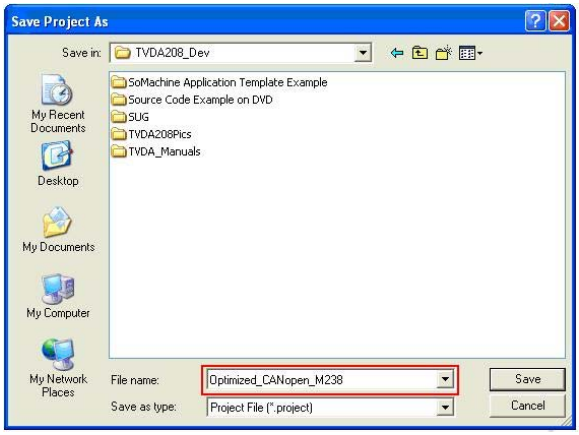
Communication Setting HMI ↔ PC

1	To configure the communication gateway double click on **HMISTU655** in the project browser.	
2	On the tab **Communication Settings**, click on **Add gateway…**	

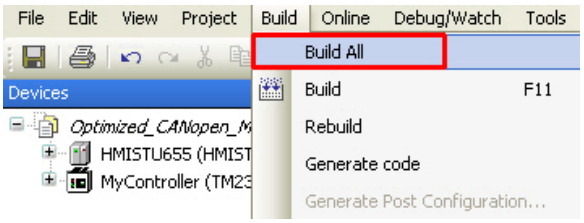
3	Retain the default values and click **OK.**	
4	Select **Gateway-1** and click **Scan network**	
5	When the scan is finished, the devices pop up under the gateway. Select the HMI used and click on **Set active path.**	
6	A hazard message pop-up window opens and the text must be read.	

7	The HMI used is now marked as **active.**	

Save the Project

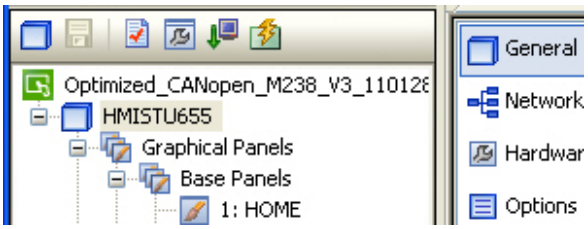
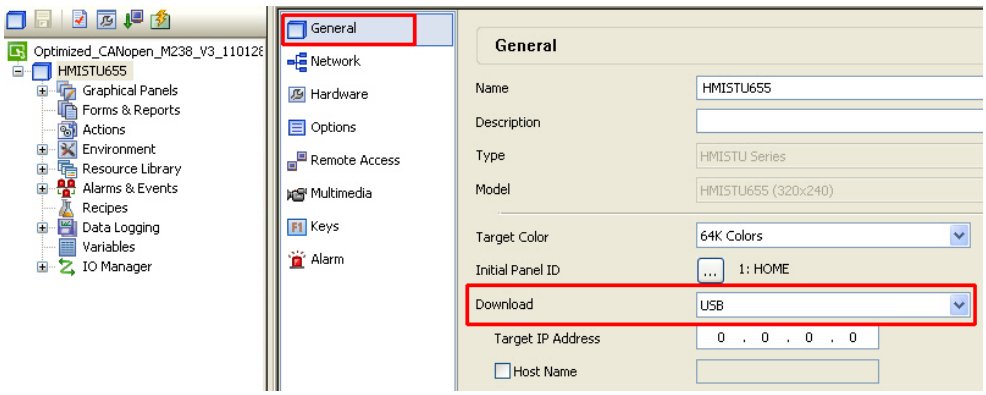
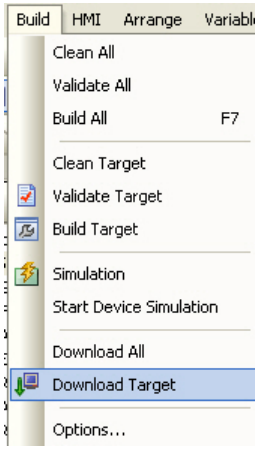
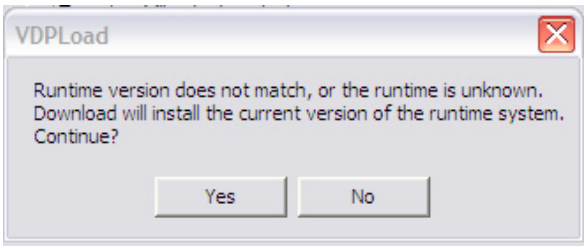
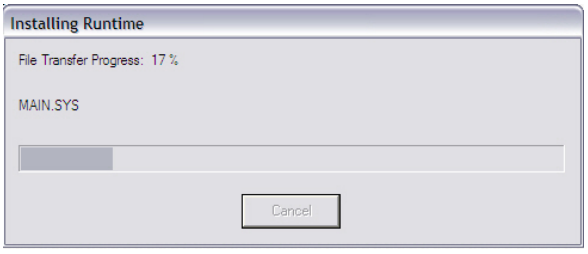
1	To save the project and change the name select: **File->Save Project As…**	
2	Enter the **File name** and click on **Save.** **Note:** By default the project is saved under **My Documents**.	

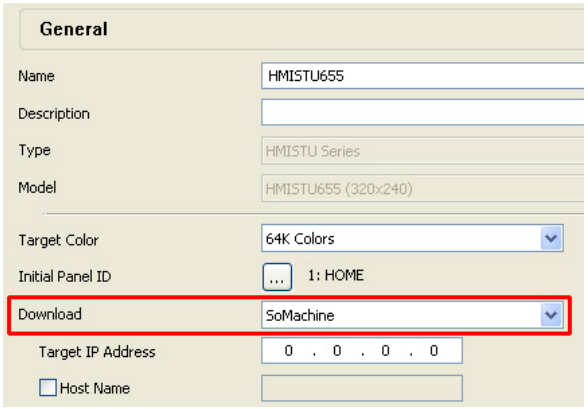
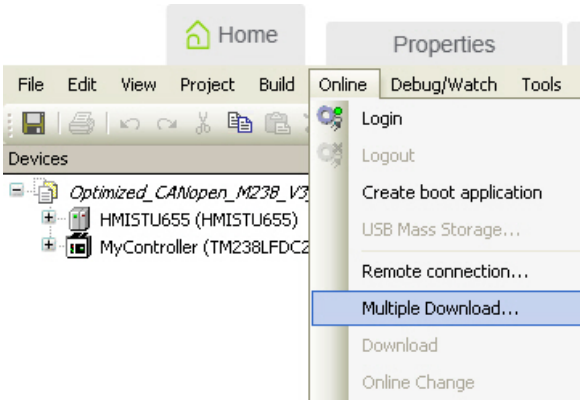
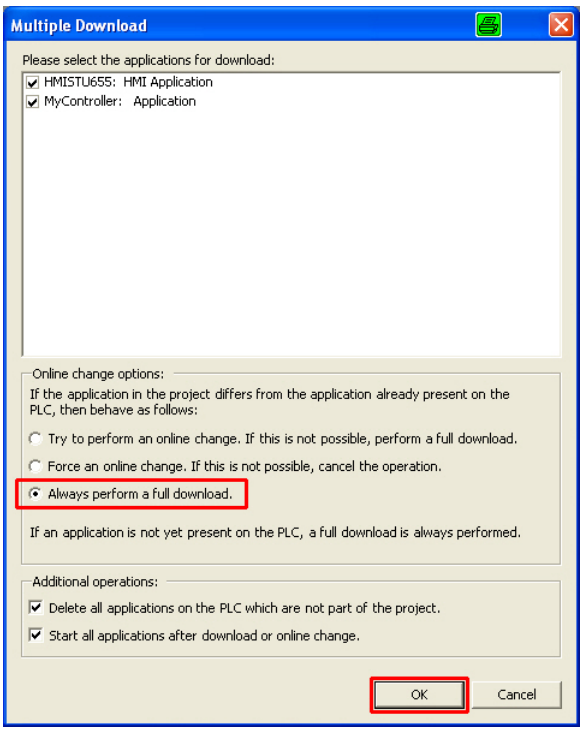
Build Application

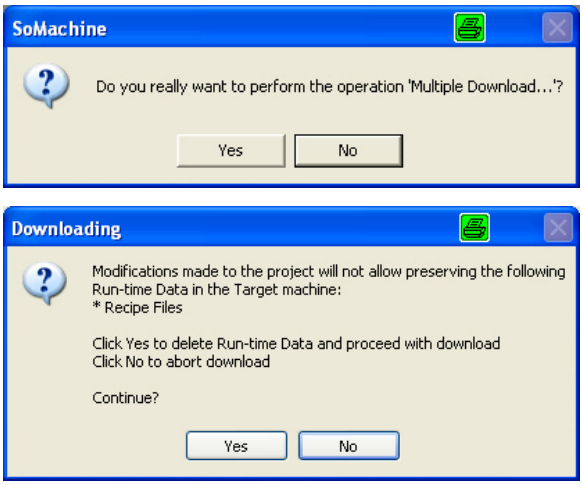
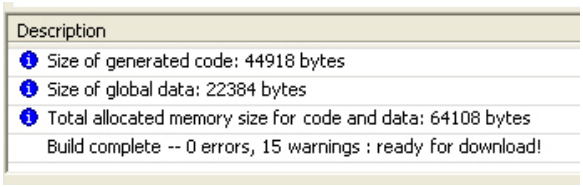
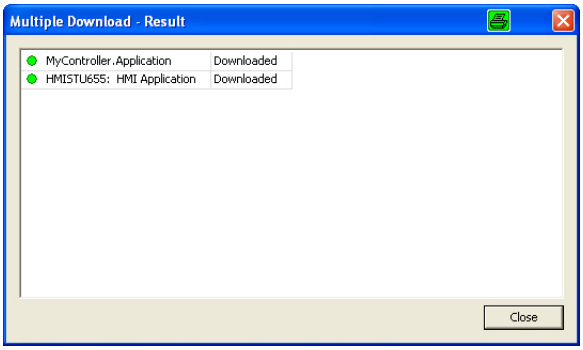
1	To build the application click on **Build → Build All.**	
2	After the build you are notified in the **Messages** field as to whether the build was successful or not. If the build was not successful there will be a list of detected compilation errors that you must remedy in the **Messages** field.	

Download the controller and HMI projects

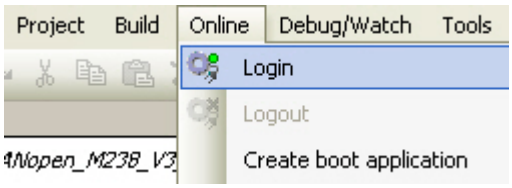
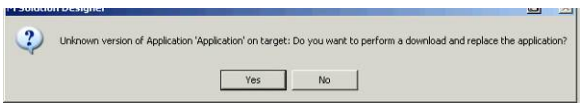
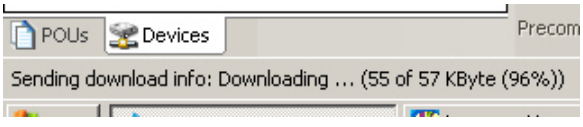
1	**Note:** If it is the first time you are connecting to the HMI you have to first download the latest runtime version to the HMI using Vijeo Designer. This first download is described in the following steps. If this is not the first download go directly to step 7.

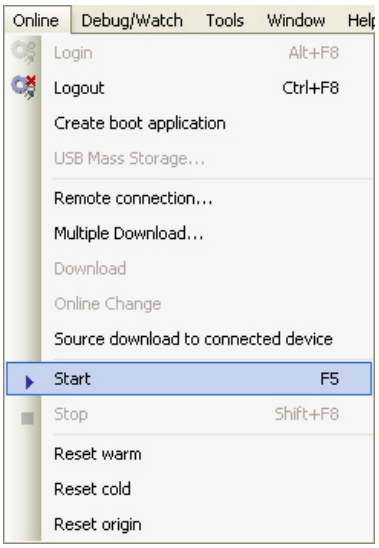
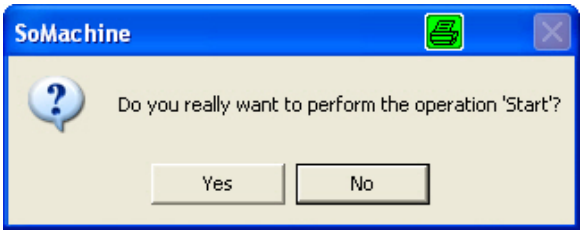
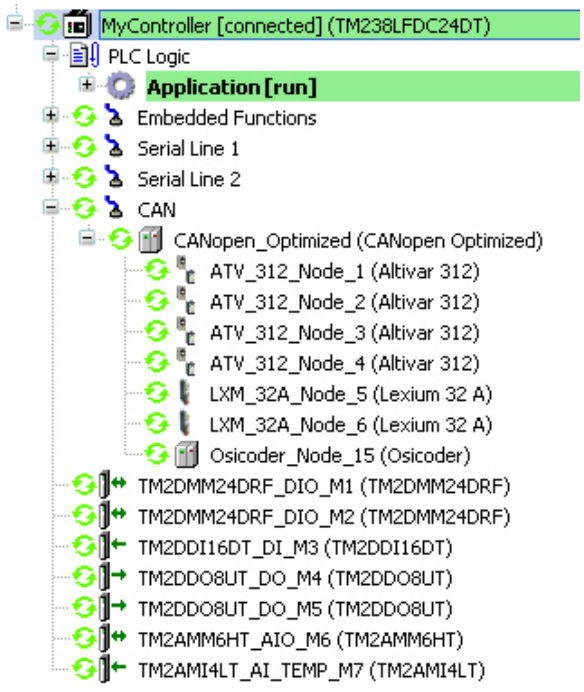
2	In Vijeo Designer select the **HMISTU655** in the device list. Then in the **General** tab select **Download** via **USB.** **Note:** The PC must be connected to the HMI via the cable **XBTZG935**.	
		
3	Select: **Build→** **Download Target**	
4	The **VDPLoad** dialog indicates that the runtime versions does not match. Start the download of the new version by clicking on **Yes**.	
5	The progress of the download is indicated.	

6	Once the download is complete, change the **Download** connection in the **General** tab back to **SoMachine.**	
7	To download the application to the controller and the HMI Select **Online →** **Multiple Download…**	
8	Check the **MyController** and the HMI **HMISTU655** and check **Always perform a full download.** click on **OK**.	

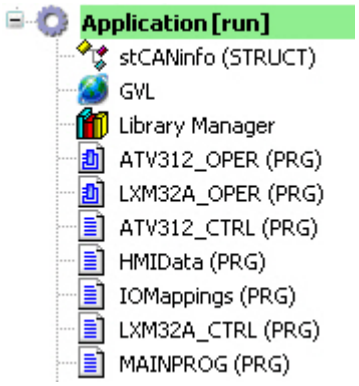
9	Click **Yes** if you want to do so	
10	Before the download starts a build of the complete project is done. The result of the build is displayed in the **message** window.	
11	The results of the download to the controller are displayed in the **Multiple Download – Result** window**.** Click on **Close** to close to the results window**.**	

Login to Controller

1	To login to the controller click **Online→** **Login**	
2	If the controller program is different from the program on the PC a message asks you if you wish to replace the old controller program. If you do not wish to replace the controller program continue with step 6, otherwise click **Yes** to confirm the download**.**	
3	The actual download status is displayed at the bottom of the main window.	

4	To start the new Application select **Online→** **Start**	
5	If you want to start the application click **Yes.**	
6	If everything is operating properly, the devices and folders are marked in green otherwise they will be marked in red.	

Application overview

1	The picture on the right shows the structure of the program. Every POU has its own entry in the structure. All of these POUs have different functions. These functions are, for example, for drive controlling etc. Additionally there are POUs for bus state and status LED.	

HMI

Introduction

This application uses a Magelis HMISTU655. This HMI device communicates via the SoMachine protocol with the controller. The HMI is programmed using the software tool **Vijeo Designer** (Delivered with SoMachine), described briefly in the following pages. For the connection between the PC and the HMI Controller use the cable **XBTZG935**.

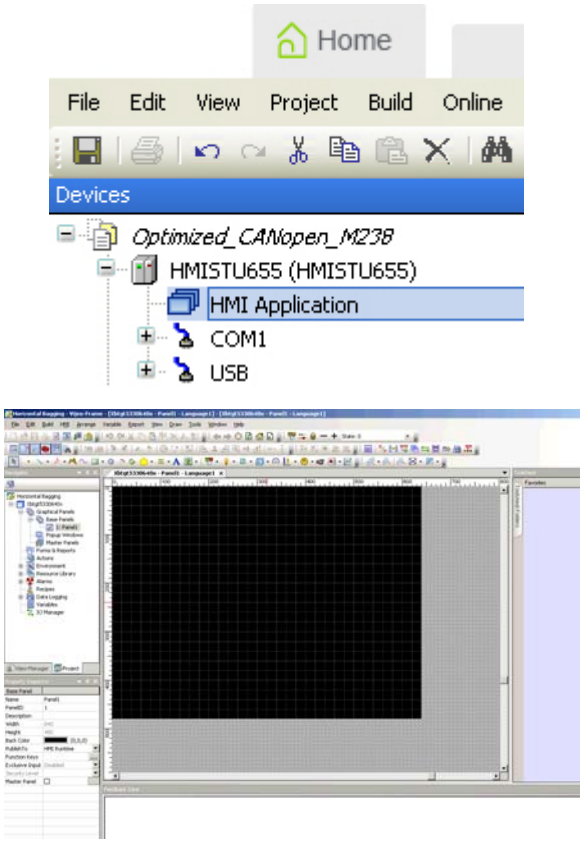
Note:
The Vijeo Designer tool is opened and closed via SoMachine software. For more information see the chapter:

Controller: Add Vijeo Designer HMI

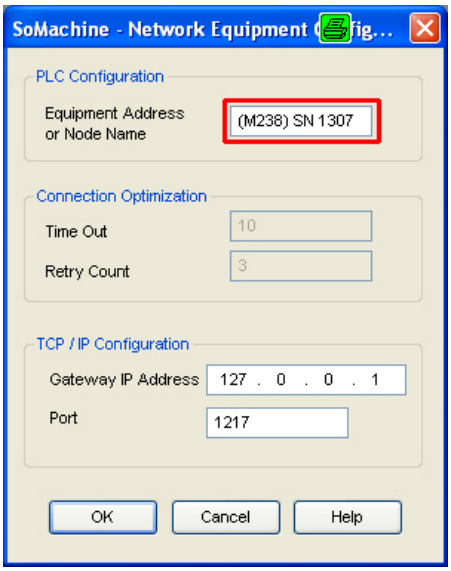
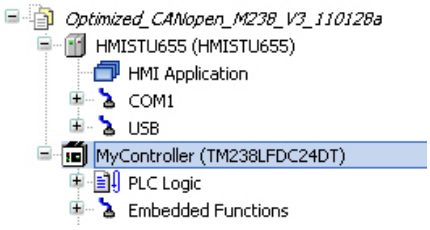
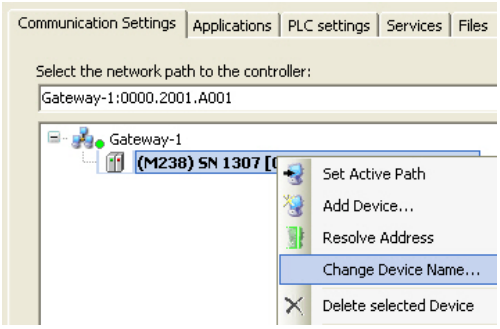
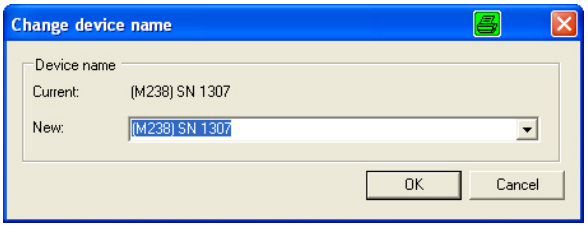
Setting up the HMI is done as follows:

- Main Window
- Communication settings
- Create a switch
- Create a numeric display
- Example screens

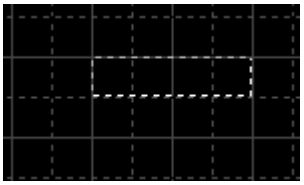
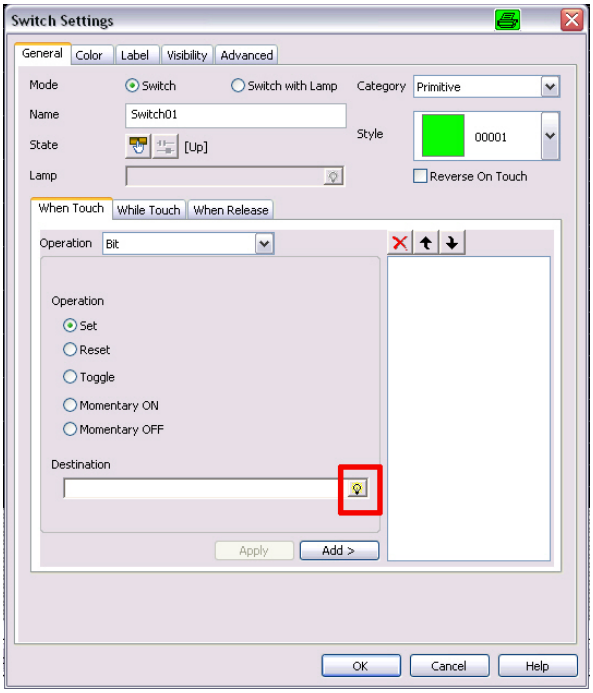
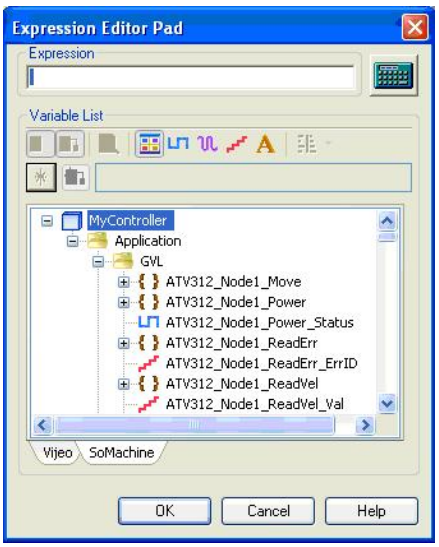
Main Window

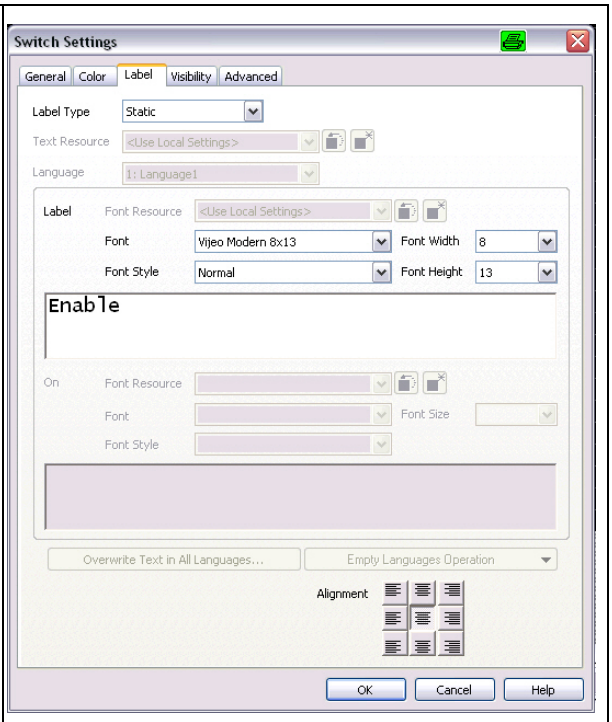
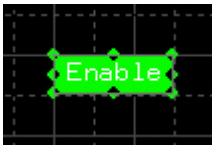
1	After double clicking on **HMI application** in SoMachine, Vijeo Designer creates the HMI program main window.	

Communi-cation settings

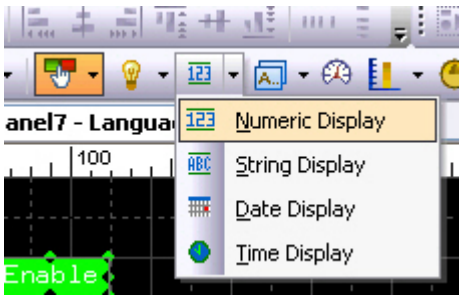
1	To set the communication parameters go in the **Navigator** to **IO Manager** → **SoMachineNetwork01** → double click on **SOM_MyController**	
2	In the dialog window, set the controller **Equipment Address.** You will find this address in SoMachine… (see next step)	
3	… by double clicking on **MyController** in the devices browser.	
4	In the **Communication Settings** tab select the controller and right click on **Change Device Name…**	
5	The **Equipment Address** of the controller is displayed as the **Device Name**.	

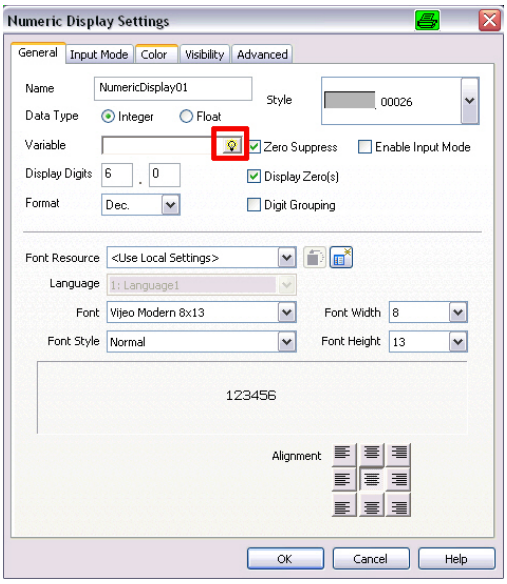
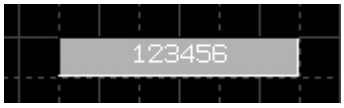
Create a switch

1	Select the **Switch** icon in the **Tool bar**	
2	Select the position and dimension where you wish to place the button by opening a rectangle on the display and pressing enter.	
3	In the **Switch Settings** dialog, select the variable that should be linked (bulb icon) to the button.	
4	Click on the bulb icon (as indicated in the image above) to open the **Variables List** dialog. Select the required variable and click **OK.**	

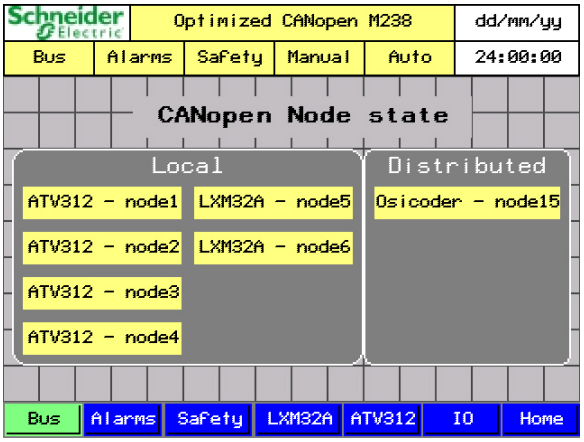
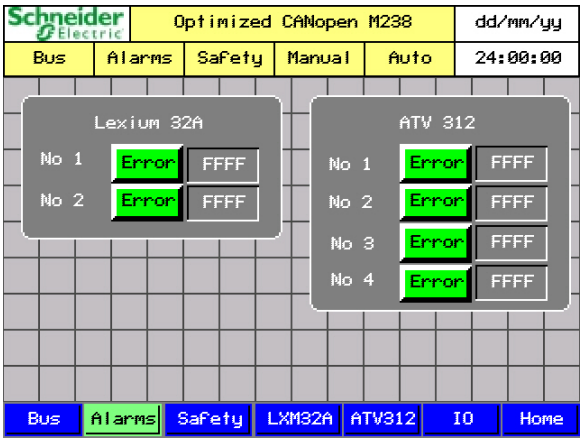
5	Go to the **Label** tab. Here select **Label Type: Static** and enter a name for the button, e.g. enable. Once you have finished your settings click on **OK**.	
6	The display now shows the new switch.	

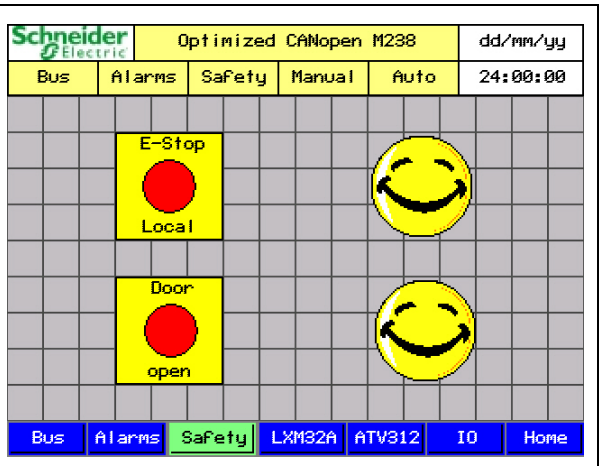
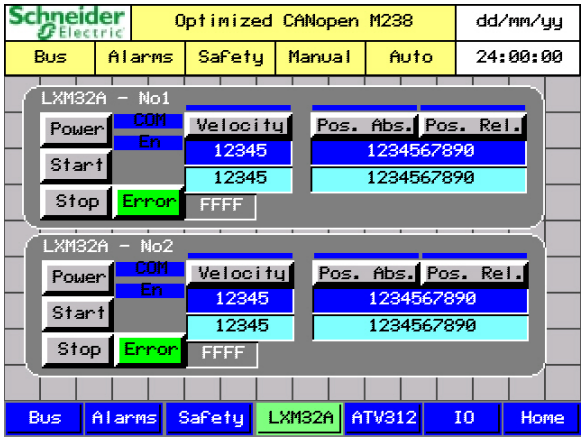
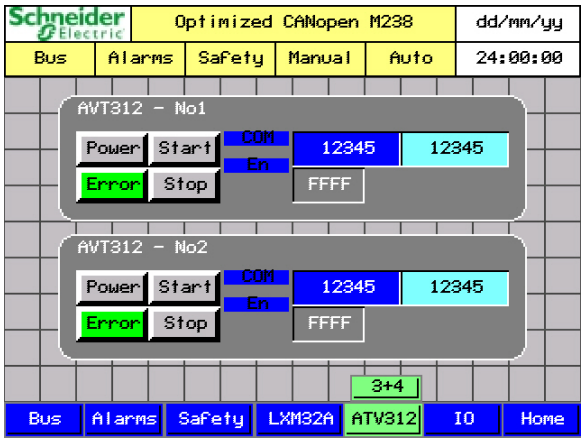
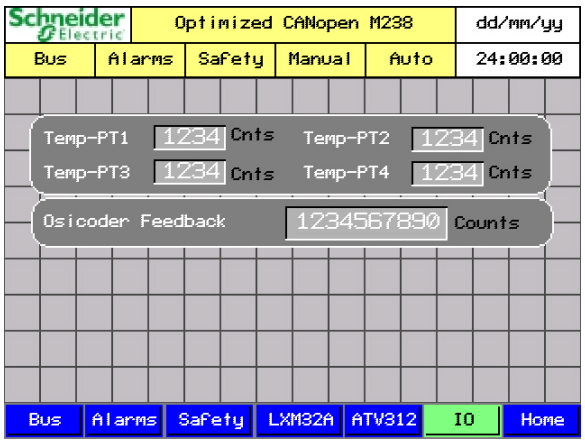
Create a Numeric Display

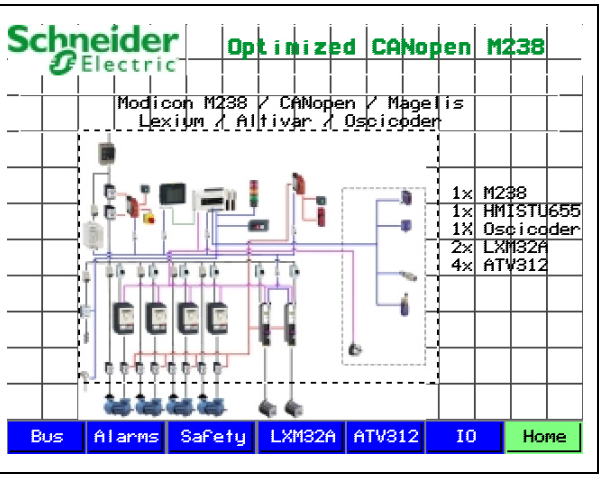
1	Click on the **Numeric Display** icon in the tool bar.	
2	Select the spot where you want to position the display by opening the rectangle and pressing **Enter**.	

3	In the **Numeric Display Settings** dialog go to the **General** tab. In **Display Digits** you can set the maximum number of the digits to be displayed for both integral and fractional part of the value. To link a **Variable** to the display click on the bulb icon to browse for a variable**.** Press **OK.**	
4	The display shows the new numeric display.	

Example screens

1	The **Bus** page shows the CANopen bus status.	
2	The **Alarms** page shows if an alarm from the device is present.	

3	The “**Safety**” page shows the status of the Emergency Stop relay.	
4	Via the **LXM32A** page it is possible control to control LXM32A	
5	Via the **ATV312** page it is possible control to control ATV312.	
6	The **IO** page shows the status of the input and output bits of the device.	

7	The **Home** page of the HMI shows a picture of the main rack	

Devices

Introduction

This chapter describes the steps required to initialize and configure the different devices required to attain the described system function.

General

Altivar 312 and Lexium 32A drives are configured by using the local control panel on the device itself.

Note

If this is not a new drive you should re-establish the factory settings. If you need instructions on how to do this, please read the drive documentation.

Be sure that the controller is in STOP state before parameterizing the drives.

Altivar 312

Introduction

The ATV312 parameters can be entered or modified via the local control panel on the front of the device itself.

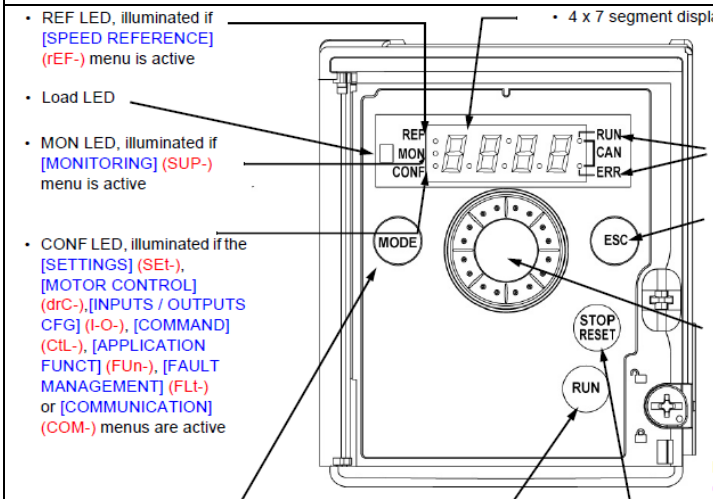
Note

If this is not a new drive you should re-establish the factory settings. If you need instructions on how to do this, please read the drive documentation.

The jog dial that is a part of the local control panel can be used for navigation by turning it clockwise or counter-clockwise. Pressing the jog dial enables the user to make a selection or confirm information

Control panel

1	The CANopen-Address and Baud rate can be input using the buttons and the jog dial on the control panel of the Altivar.

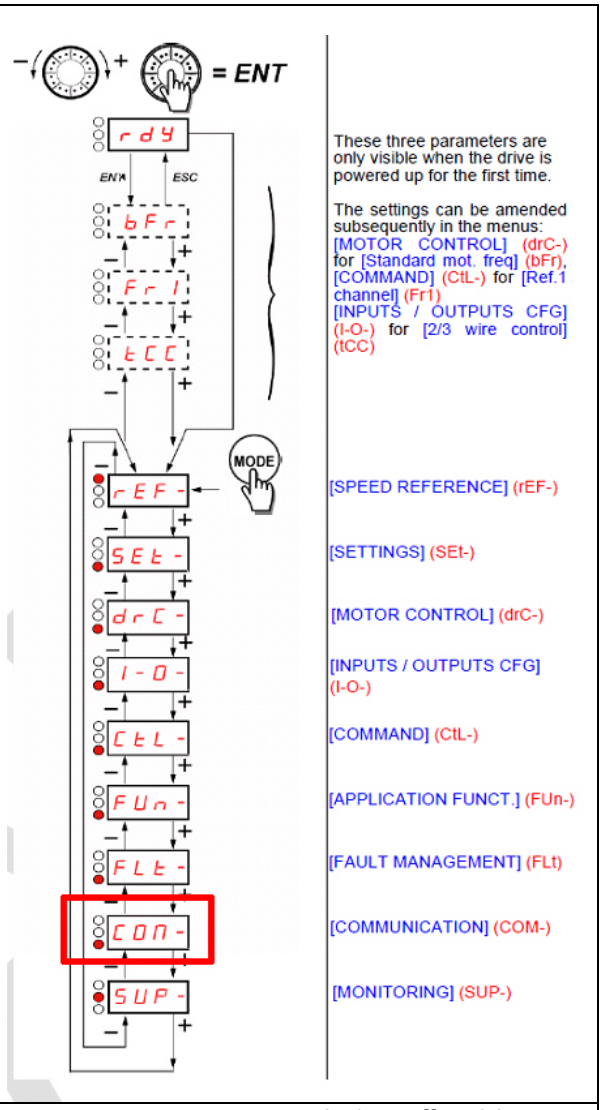


- REF LED, illuminated if [SPEED REFERENCE] (rEF-) menu is active
- Load LED
- MON LED, illuminated if [MONITORING] (SUP-) menu is active
- CONF LED, illuminated if the [SETTINGS] (SEt-), [MOTOR CONTROL] (drC-),[INPUTS / OUTPUTS CFG] (I-O-), [COMMAND] (CtL-), [APPLICATION FUNCT] (FUn-), [FAULT MANAGEMENT] (FLt-) or [COMMUNICATION] (COM-) menus are active
- MODE button (1): If [SPEED REFERENCE] (rEF-) is displayed, this will take you to the [SETTINGS] (SEt-) menu. If not, it will take you to the [SPEED REFERENCE] (rEF-) menu.
- 4 x 7 segment display
- 2 CANopen status LEDs
- Used to quit a menu or parameter or to clear the value displayed in order to revert to the value in the memory
- Jog dial - can be used for navigation by turning it clockwise or counter-clockwise - pressing the jog dial enables the user to make a selection or confirm information. = *ENT*

  Functions as a potentiometer if [Ref.1 channel] (Fr1-) in the [COMMAND] (CtL-) menu is set to [Image input AIV1] (AIV1)
- RUN button: Controls powering up of the motor for forward running if the [2/3 wire control] (tCC) parameter in the [INPUTS / OUTPUTS CFG] (I-O-) menu is set to [Local] (LOC), page 45

STOP/RESET button
- Enables detected fault to be reset
- Can be used to control motor stopping
  - If [2/3 wire control] (tCC) is not set to [Local] (LOC), freewheel stop
  - If [2/3 wire control] (tCC) is set to [Local] (LOC), stop on ramp or freewheel stop during DC injection braking

CANopen settings

1	Using the buttons on the front panel, select the sub-menu **Communication**.	
2	In the **Communication (COM)** sub-menu input the CANopen address in the parameter **AdC0.** In the example application the addresses for the four drives are **1** to **4.**	
3	Also in the **Communication (COM)** sub-menu, in the parameter **BdC0,** set the Baud rate to **500.0** (kBits).	
4	For the drive to operate with the new parameters, a power cycle (on, off, on) is required.	

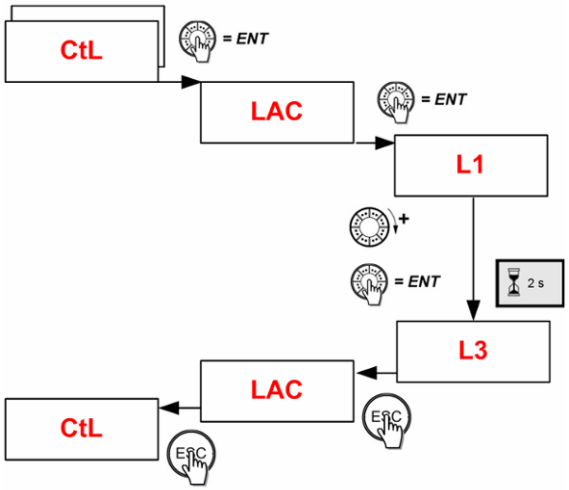
⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

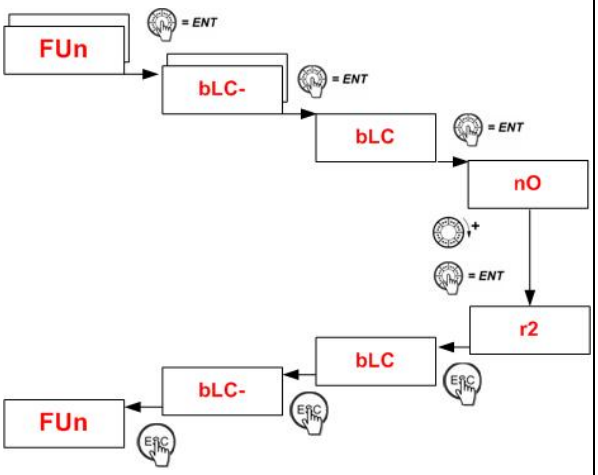
After making any configuration changes or adjustments, be sure to cycle power (remove and reapply power) on the drive.

Failure to follow these instructions can cause death, serious injury or equipment damage.

Changing the Access Level LAC

1	To set the parameters for the brake function a higher access level (L3) is required.	
2	To go to expert mode L3: ➔ Select **CtL** [COMMAND] and press enter ➔ Select **LAC** [ACCESS LEVEL] and press enter ➔ **L1** (Level 1) is displayed ➔ Select **L3** (Level 3) and press enter for 2 seconds to set the new level. Return to the **LAC** with **ESC.** Return to the **CtL** with **ESC.**	

Brake settings

1	The r2 relay output is used for brake control.	
2	To assign the r2 relay output: ➔ Select **FUn** [APPLICATION FUNCT.] and press enter ➔ Select **bLC-** [BRAKE LOGIC CONTROL] and press enter ➔ Select **bLC** [BRAKE LOGIC CONTROL] and press enter ➔ Select **r2** and press enter. Set the parameters to the values shown here on the right. **Note:** These parameters are for the machine described in this example only. In all likelihood, you will need to adapt these parameters for your specific machine. After all parameters are set return to the **bLC** with **ESC.** Return to the **bLC-** with **ESC.** Return to the **FUn** with **ESC.**	

Brake Logic parameters	
Parameter	**Value**
bLC [Brake assignment]	R2
brL [Brake release freq]	0 Hz
Ibr [Brake release I FW]	0 A
brt [Brake release time]	0 s
LSP [Low speed]	0 Hz
bEn [Brake engage freq]	0 Hz
bEt [Brake engage time]	0.5 s
bIP [Brake impulse]	No

Control settings

1	As drive control is CANopen used. ➔ Select **CtL** and press enter ➔ Select **FR1** and press enter ➔ Select **net** and press enter. Return to the **FR1** with **ESC.** Return to the **CtL** with **ESC.**

Power cycle

1	For the drive to operate with the new parameters, a power cycle (on, off, on) is required.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

After making any configuration changes or adjustments, be sure to cycle power (remove and reapply power) on the drive.

Failure to follow these instructions can cause death, serious injury or equipment damage.

Lexium 32A

Introduction

The LXM32A parameters can be entered or modified via using the local control panel on the front of the device itself.

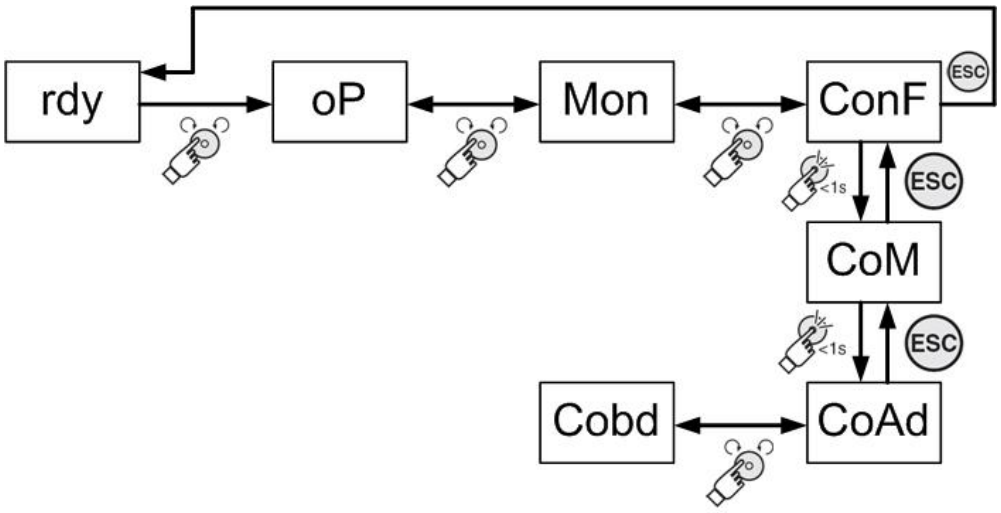
Note:
If this is not a brand new drive you should re-establish the factory settings. If you need instructions on how to do this, please refer to the drive documentation

CANopen settings

1 If the drive is being started for the first time, the **FSu** (First Setup) is invoked. Only the CANopen address (**CoAd**) and the baud rate (**Cobd**) is initially needed.

If the drive has never been started before, follow the steps below to change the address or the baud rate.

In this project the **CANopen address** for the drives are **5 and 6.** The **Baud rate** for the drives is **500 kBaud**.



Parameter name HMI menu HMI name	Description
CANaddress ConF → CoN- ConF → FSu- CoAd	CANopen address (node number) Changed settings become active the next time the product is switched on.
CANbaud ConF → CoN- ConF → FSu- Cobd	CANopen baud rate **50 / 50 kBaud /** 50: 50 kBaud **125 / 125 kBaud /** 125: 125 kBaud **250 / 250 kBaud /** 250: 250 kBaud **500 / 500 kBaud /** 500: 500 kBaud **1000 / 1 MBaud /** 1000: 1 MBaud Changed settings become active the next time the product is switched on.

2	For the drive to operate with the new parameters, a power cycle (on, off, on) is required.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

After making any configuration changes or adjustments, be sure to cycle power (remove and reapply power) on the drive.

Failure to follow these instructions can cause death, serious injury or equipment damage.

Appendix

The Packaging Application

Introduction

Different machines and processes share the same initial requirements that can be implemented with a generic architecture employing the current Schneider Electric product offer. These generic architectures include power supply, controller, motion, visual indication, communication and safety aspects. The use of these generic architectures to implement customer solutions covers not only covers a large section of customer automation requirements but allows the implementation of a tested and validated software and hardware solution.

This chapter describes the Schneider Electric packaging application function blocks used in this architecture. This document does not provide a functional description for the application solution. The functions listed here are not comprehensive and form only a foundation for real life applications. It is not intended to provide an application that fulfills a real life situation in all aspects. For a comprehensive description of the function blocks please refer to the library and function block documentation.

The information given here is intended to support the user in the assembly, configuration and implementation of the described solution. The information provided here is additional information to the product documentation, with a focus on the specific components used in the solution provided here.

It is expected that the reader has at least a basic knowledge of the industrial application for which this solution is provided and understands the professional jargon normally used in that type of application. This document is not an introduction into the specific type of industrial application for which this solution is provided.

Note:
The packaging application function blocks can only be used with S-type controllers.
If you use G-type controllers, the message *"Use of <Name of FB> is not authorized with the current type of device*" appears during the build phase.
The packaging library and the S-type option will be available after installation of the solution extension of SoMachine.

Application Basics

The solution described in this document is provided for packaging applications which may consist of the following three machine types:

- Primary machines

  These machines work in direct contact with the products to be packaged:

  - Horizontal bagging machines
  - Vertical bagging machines
  - Flexible package form, fill & seal machines
  - Rigid package fill and close machines
  - Blister fill and seal machine
  - Filling and closing machines

- Secondary machines

  Secondary machines are linked to products that are required to pack the primary product and any accessories that must be combined in the package:

  - Boxing and carton machines
  - Wrapping machines (sleeve, wrap-around, shrink)
  - Palletizing / de-palletizing machines
  - Pallet securing (stripping, shrink wrapping, stretch ...)

- Others

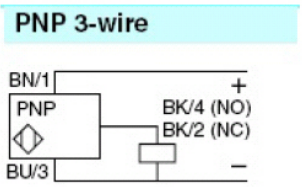
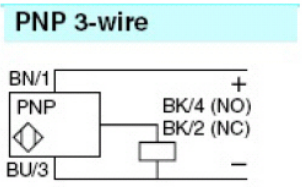
  Machines not linked to packaging functions but are part of the packaging process:

  - Labeling
  - Marking
  - Decorating
  - Cleaning machines
  - Feeding machines and systems
  - Rinsing & washing machines
  - Cooling machines
  - Drying machines
  - Testing & inspection machines

Application Specifics

Application Dedicated Hardware

General description of the hardware

Modicon M238 Logic controller **S-Type** **TM238LFDC24DTS0** 14 Digital Inputs 10 Digital Outputs		
OsiSense (Osiprox) **Inductive proximity sensor** **XS612B1PAL2** Pre-cabled (L = 2 m) for Digital Tension Control		
OsiSense (Osiprox) **Inductive proximity sensor** **XS508B1PBM8** for Pick and Place with cable **XZCP0166L5**		

<table>
<tr><td rowspan="2">OsiSense (Osiprox)

Inductive proximity sensor

XS4P12AB120

4…20 mA

Pre-cabled (L = 2 m)

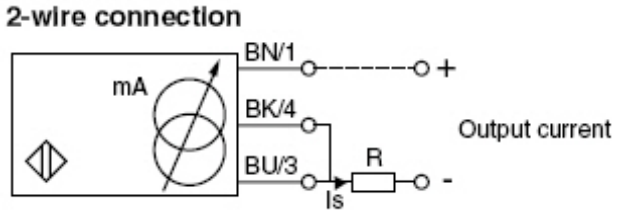
for
Analog Tension Control</td><td> </td></tr>
<tr><td> 
</td></tr>
<tr><td>OsiSense (Neptune)

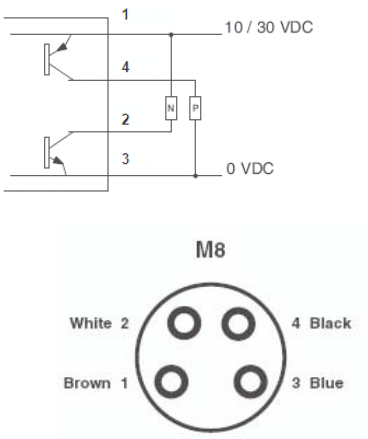
Photo-electric sensor

XUYFANEP40015

for

Lateral Position Control

with cable

XZCP0941L5</td><td> </td><td> 
</td></tr>
</table>

Application Function Blocks

To facilitate the software engineering tasks associated with the application described, Schneider Electric has developed the Packaging Application Function Block Library that has been tested and validated.

The following pages list the application function blocks that are implemented in the architecture described here.

The **Packaging** and the **Toolbox** libraries need to be included in the application program (See the chapter *Controller: Include new library file*)

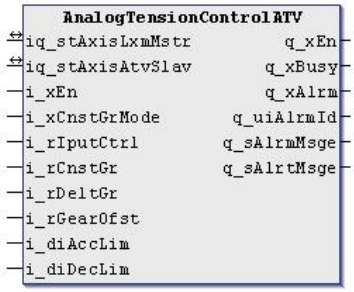
For additional information concerning the packaging AFB's please refer to the SoMachine help.

The following is a list of packaging functions which are running on the Optimized CANopen M238 architecture:

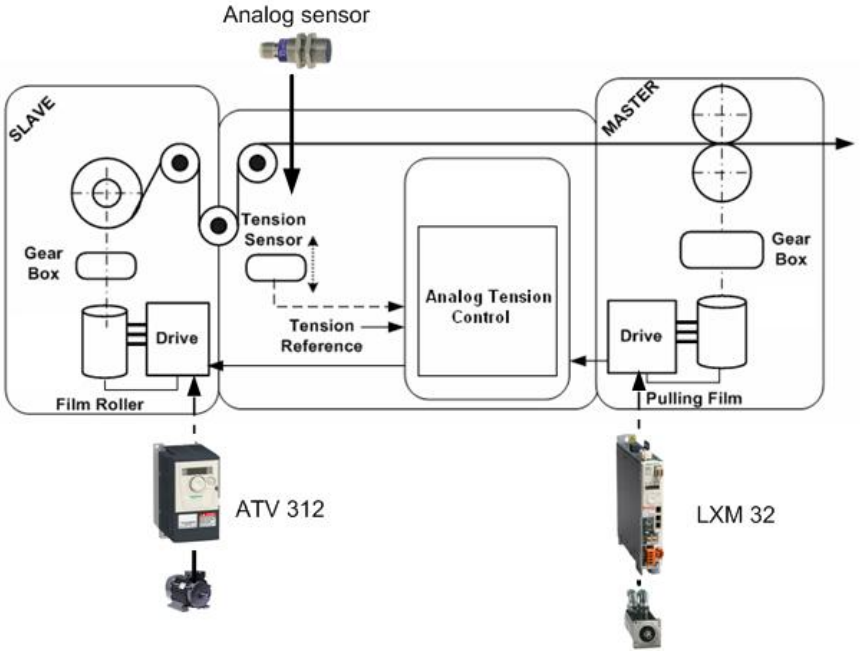
- AnalogTensionControlATV
- DigitalTensionControlATV
- LateralPositionControl
- TemperatureControl
- XYPickAndPlace
- MoveJog

FB AnalogTensionControlATV

The goal of this Application Function Block is to maintain the tension of the film between two points. This is achieved by controlling the position of the arm dancer. This Application Function Block is the link between a slave axis and a master axis via an analog sensor.

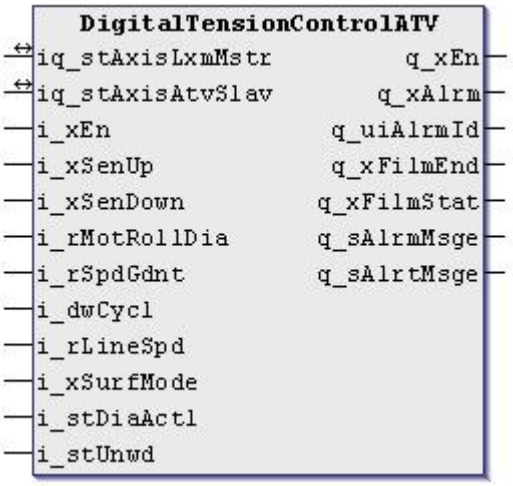


AnalogTensionControlATV setup

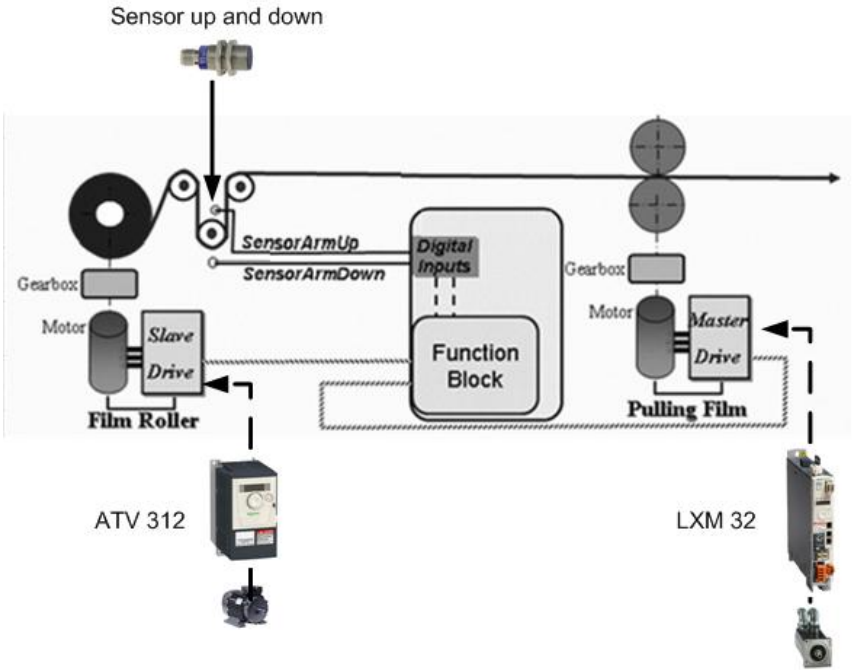


FB DigitalTensionControlATV

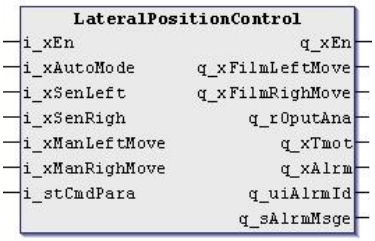
The goal of this Application Function Block template is to maintain the tension of the film between two limits. This is achieved by controlling the position of the arm dancer. This Application Function Block provides the coupling between a slave axis and a master axis using a digital sensor.



DigitalTensionControlATV setup



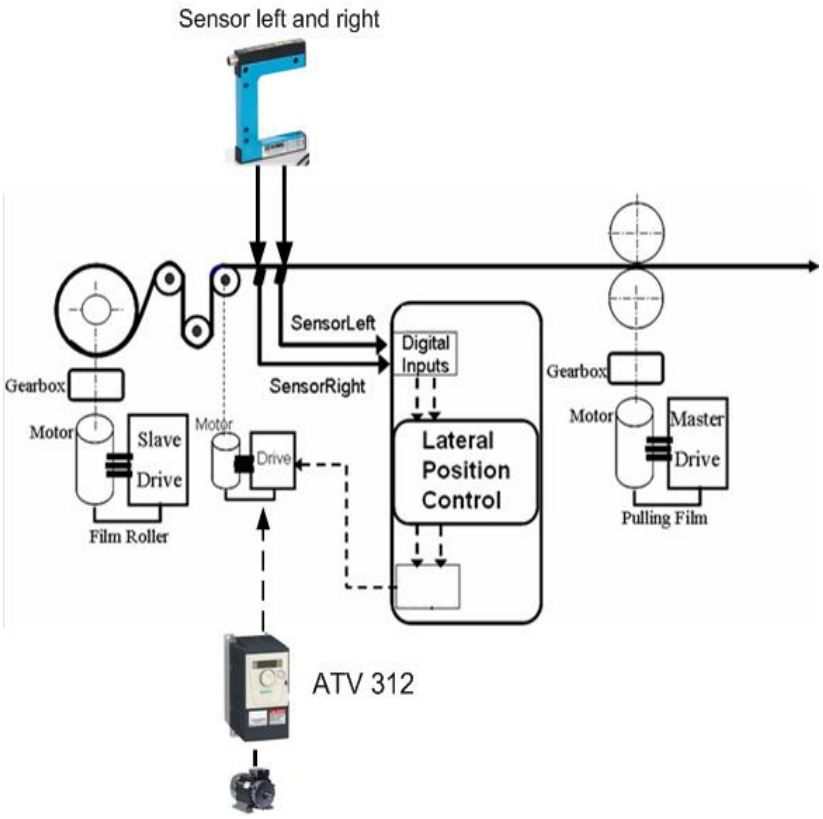
FB LateralPositionControl



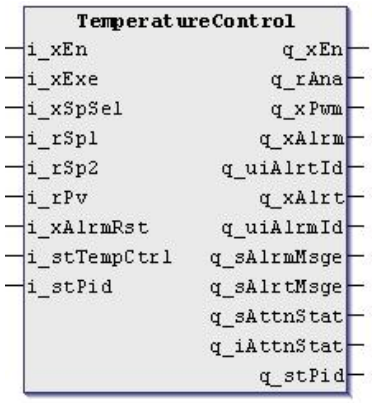
This block controls and corrects the lateral positioning of a film while it is unwinding from a reel.
This function helps the “cutting device” to cut film at the correct position. The correction is based on fixing the edges of the film between two digital sensors. If the lateral film position is in good (e.g. between SensorLeft and SensorRight), the path is not corrected. If, however, depending on sensor configuration, the film position is incorrect, it must be corrected. One can select between digital or analog output mode.

In this architecture digital output is used.

LateralPositionControl setup



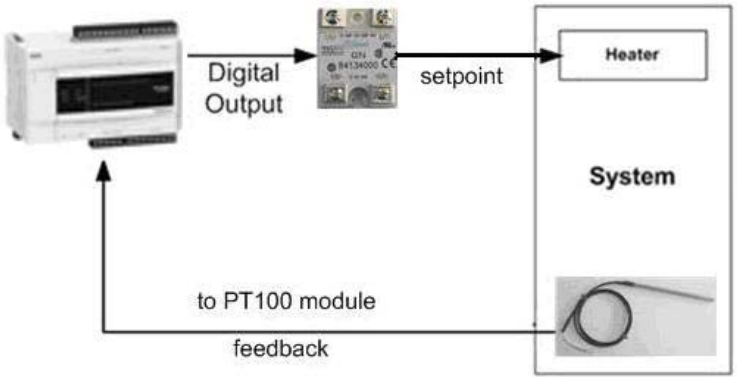
FB TemperatureControl



The function block TemperatureControl is designed for monitoring and controlling a wide variety of temperature-dependent processes.
Main characteristics

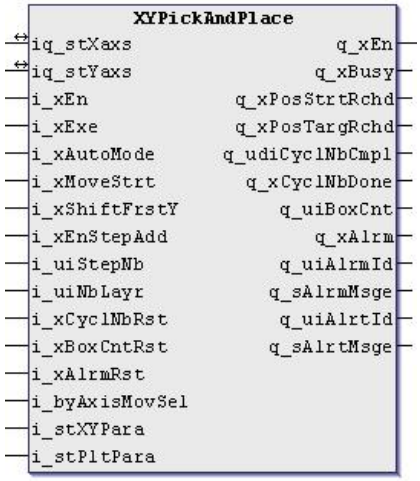
- Auto-Tuning or Self-Tuning based on inflectional tangential method
- Pulse width modulation output for controlling switching actuators
- Standby function
- Filtering functions for analogue sensor input
- Set point ramping function
- Tolerance band monitoring (two different tolerance bands)
- Absolute value monitoring
- Commissioning screens

TemperatureControl setup



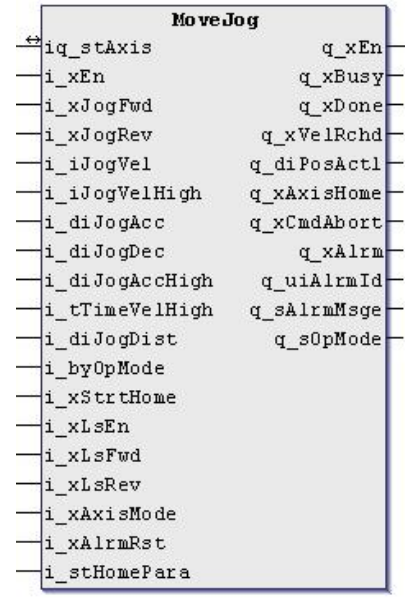
FB XYPickAndPlace

The goal of the Application Function Block is to control two linear axis which move manufactured parts from one assembly station to another station or from conveyor to pallet.

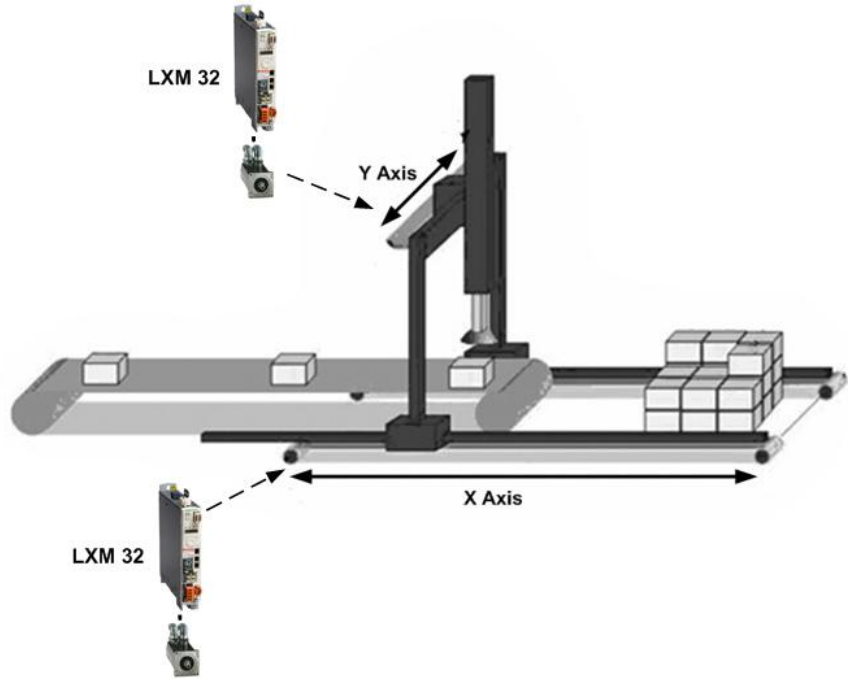


FB MoveJog

The goal of the Application Function Block is to run an axis in speed mode, position mode or to home an axis.



XYPickAndPlace and MoveJog setup



Detailed Component List

The following is a list of components for the main components of the Optimized CANopen M238 architecture. A complete component list for the architecture can be found in the EPLAN file "Optimized_CANopen_M238_WID.pdf"

Cabinet

Hardware-Components				
Pos.	**Qty**	**Description**	**Part Number**	**Rev./ Vers.**
1.1	1	Cabinet with mounting plate 1800 x 1000 x 600 mm (HxWxD)	NSYSF181060P	
1.2	1	Side wall 1800 x 600 mm	NSY2SP186	
1.3	1	Fan with filter, 165 m³/h, 230 Vac	NSYCVF165M230PF	
1.4	1	Cabinet Lights	NSYLAM75	
1.5	1	Thermostat 1NO 0-60°C	NSYCCOTHO	
1.6	1	Air Filter	NSYCAG223LPF	

Main Switch

Hardware-Components				
Pos.	**Qty**	**Description**	**Part Number**	**Rev./ Vers.**
2.1	1	Main Switch 36 kW	LV429003	
2.2	2	Tripping Device TM 16D	LV429037	
2.3	1	Rotary Handle Extension	LV429340	
2.4	2	Terminal cover	LV429515	

Power Supply

Optional

Hardware-Components				
Pos.	**Qty**	**Description**	**Part Number**	**Rev./ Vers.**
3.1	1	Power Supply 240 Vac / 24 Vdc	ABL8RPS24100	
3.2	1	Solid State relay for Heating	SSRPCDS10A1	
3.3	1	Disconnect Terminal (9760U/8TKE48)	5711016550 (Wieland)	
3.4	1	Power Supply 230 Vac / 24Vdc	ABL4RSM24100	

M238

Hardware-Components				
Pos.	**Qty**	**Description**	**Part Number**	**Rev./ Vers.**
4.1	1	Modicon M238	TM238LFDC24DT	V2.0.30.9
4.2	1	Option: Backup battery for M238 controller	TSXPLP01	
4.3	2	Digital Input/Output Module 16 IN, 8 OUT	TM2DMM24DRF	
4.4	1	Digital Input Module 16 IN, 24 Vdc	TM2DDI16DT	
4.5	2	Digital Output Module 8 OUT	TM2DDO8UT	
4.6	1	Analog Input/Output 4 IN, 2 OUT, 0-10 Vdc /4-20 mA	TM2AMM6HT	
4.7	1	Pt100 Input Module, 4 IN	TM2AMI4LT	

Drives

Hardware-Components				
Pos.	**Qty**	**Description**	**Part Number**	**Rev./ Vers.**
5.1	2	ATV 312 variable speed drives 0.37 kW	ATV312H037N4	V5.1 IE 50
5.2	2	ATV 312 variable speed drives 0.75 kW	ATV312H075N4	V5.1 IE 50
5.3	2	Lexium 32 servo drives, continuous output current: 6 A RMS at 6000 RPM	LXM32AD18M2	V01.06.06
5.4	2	BMH servo motor with brake	BMH0702T02F2A	
5.5	2	Power cable for Lexium 32 , 5 m	VW3M5101R50	
5.6	2	Encoder cable for Lexium 32, 5 m	VW3M8102R50	
5.7	4	Three Phase AC Motor 230/380 Vac, 0.18kW	MOTOR_380	
5.8	4	Magnetic Circuit Breaker 2.5 A	GV2L07	
5.9	2	Magnetic Circuit Breaker 10 A	GV2L14	
5.10	2	Auxiliary Contacts for circuit breaker 1NC + 1 NO	GVAE11	
5.11	4	ATV312 CANopen daisy chain option card	VW3A31208	

Sensors

Hardware-Components				
Pos.	**Qty**	**Description**	**Part Number**	**Rev./ Vers.**
6.1	1	Inductive proximity sensor pre-cabled 2 m (optional for Analog Tension Control)	XS4P12AB120	
6.2	2	Inductive proximity sensor pre-cabled 2 m (optional for Digital Tension Control)	XS612B1PAL2	
6.3	4	Inductive proximity sensor with M8 connector (optional for Pick and Place)	XS508B1PBM8	
6.4	4	Sensor cable M8, 5 m (optional for Pick and Place)	XZCP0166L5	
6.5	7	Fixing bracket for proximity sensor (optional packaging machine sensors)	XSZB108	
6.6	2	Photo-electric sensor with M8 connector (optional Lateral Position Control)	XUYFANEP40015	
6.7	2	Sensor cable M8, 5 m (optional Lateral Position Control)	XCZP0941L5	
6.8	1	Inductive Proximity sensor with M8 connector (optional for generic purposes)	XS608B1PAM12	
6.9	1	Sensor cable M12, 2 m (optional for Inductive Proximity sensor)	XZCP1264L2	
6.10	1	Photoelectric sensor with M12 connector (optional for generic purposes)	XUB1APANM12	
6.11	1	Sensor cable M12, 2 m (optional for Photoelectric sensor)	XZCP1264L2	
6.12	1	Reflector 50 x 50 (optional for Photoelectric sensor)	XUZC50	
6.13	4	Sensor for Temperature measurement Pt100	PT46X150	

Encoder

Hardware-Components				
Pos.	**Qty**	**Description**	**Part Number**	**Rev./ Vers.**
7.1	1	OsiSense CANopen SSI Encoder	XCC3510PS84CB	

HMI

Hardware-Components				
Pos.	**Qty**	**Description**	**Part Number**	**Rev./ Vers.**
8.1	1	Magelis STU655	HMISTU655	V6.0
8.2	1	Communication Cable (HMI to M238)	VW3A8306R30	

E- Stop and Door Guarding

Hardware-Components				
Pos.	**Qty**	**Description**	**Part Number**	**Rev./ Vers.**
9.1	1	Emergency Stop Safety module XPS AV	XPSAV31111Z002	
9.2	1	Emergency Stop button rotation release	XB5AS844	
9.3	1	Safety Extension Module	XPSECP5131	
9.4	1	Door Guarding Safety Module XPS AC	XPSAC5121	
9.5	1	Auxiliary contacts for cabinet Emergency Stop	ZB5AZ141	
9.6	1	Assembly housing	XALD01	
9.7	1	Door guard switch	XCSPA792	
9.8	1	Actuator for door guard	XCSZ12	
9.9	1	E-Stop contactors 7.5 kW	LC1D18BL	
9.10	8	Door contactors 2.5 kW	LC1D09BL	

Harmony

Hardware-Components				
Pos.	**Qty**	**Description**	**Part Number**	**Rev./ Vers.**
10.1	2	Pushbutton 1 NC	XB5AA42	
10.2	1	Box for 3 buttons	XALD03	
10.3	1	Signal Lamp White	XB5AVB1	
10.4	2	Pushbutton with LED Green	XB5AW33B5	
10.5	2	Pushbutton with LED Blue	XB5AW36B5	
10.6	1	Connection element	XVBC11	
10.7	1	Terminal	XVBC21	
10.8	1	Signal Pillar Pipe	XVBC02	
10.9	1	Signal element green	XVBC2B3	
10.10	1	Signal element red	XVBC2B4	
10.11	1	Signal element blue	XVBC2B6	
10.12	1	Signal element white	XVBC2B6	

CANopen

Hardware-Components				
Pos.	**Qty**	**Description**	**Part Number**	**Rev./ Vers.**
11.1	1	CANopen Tap with 4x SUB D9	TSXCANTDM4	
11.2	1	CANopen cord set SUBD9 RJ45 1 m	TCSCCN4F3M1T	
11.3	1	CANopen terminator RJ45	TCSCAR01NM120	
11.4	1	M12 Socket for CANopen IN	1525649 (Phoenix)	
11.5	4	CANopen cable; 2xRJ45; 0.30m	VW3CANCARR03	
11.6	1	CANopen cable; 2xRJ45; 1m	VW3CANCARR10	
11.7	1	Terminal resistor	FTXCNTL12	
11.8	1	Osicoder connecting cable CANopen	FTXCN3250	
11.9	1	CANopen PLUG	TSXCANKCDF90TP	

Software

Software-Components				
Pos.	**Qty**	**Description**	**Part Number**	**Rev./ Vers.**
12.1	1	SoMachine (includes Vijeo Designer) on DVD, trial version	MSDCHNSFNV30	V3.0
12.2	1	Single user license for SoMachine	MSDCHNL●UA	
12.3	1	SoMachine (includes Vijeo Designer) with Solution Extension on DVD, single user license (instead position 12.1 and 12.2)	MSDCHLLMUV30S0	V3.0
12.4	1	Programming cable	XBTZG935	

Component Protection Classes

Positioning Protection Class	In Field, On Site			Cabinet		
Component				Front		Inside
	IP54	IP65	IP67	IP55	IP65	IP20
Main Switch, with or without under voltage protection and integrated indicator						X
Emergency Stop switch housing XALK		X				
Preventa relays XPSAC5121						X
Single/Double switch housing, complete		X				
Control switch, 3 positions					X	
Indicator buttons		X				
Buttons with LED + 1 switch						X
Labels 30x40		X				
Positions switch Universal		X				
TeSys contactor						X
Phaseo Power Supply						X
Modicon M238 Logic controller						X
Magelis HMISTU655					X	X
Altivar 312 variable speed drive						X
Lexium 32A servo drive						X
BMH Servo motor		X shaft end IP40				

Environmental Characteristics

NOTE: The equipment represented in the architecture(s) of this document has been rigorously tested to meet the individually specified environmental characteristics for operation and storage, and that information is available in the product catalogs. If your application requirements are extreme or otherwise do not appear to correspond to the catalog information, your local Schneider Electric Support will be eager to assist you in determining what is appropriate for your particular application needs.

Component Features

Components

Power Supply Phaseo: ABL8RPS24100

- 1 or 2 phase connection
- 100...120 Vac and 200...500 Vac input
- 24 Vdc output
- 10 A output
- Diagnostic relay
- Protected against overload and short circuits

Modicon M238 Logic controller:
TM238LFDC24DT or TM238LFDC24DTS0

The M238 is powered with 24 Vdc, offer:

- •••S0 is the solution controller or S-type controller
- CANopen bus master link
- 14 x 24 Vdc inputs including 8 fast inputs, dedicated to special functions such as HSC high-speed counter
- 10 x 24 Vdc solid state outputs including 4 fast outputs, dedicated to special functions such as counting, PWM and PTO
- An RS 232/RS 485 serial link (ASCII or Modbus protocol).
- A Modbus RS 485 serial link mainly dedicated to connection of a Human/Machine interface terminal (link providing a 5 V power supply for a Magelis Small Panel XBT NP00/R400/RT500)
- Expand the I/O count by adding up to 7 expansion modules. The following modules are available:
    - Discrete TM2DDI/DDO/DMM/DRA
    - Analog TM2AMI/ALM/ARI/AMO/AVO/AMM
    - High-speed counter TM200HSC210DT/DF

Altivar 312 Variable Speed Drive

The Altivar 312 drive is a frequency inverter for 3-phase squirrel cage asynchronous motors. The Altivar 312 is robust, compact, easy to use and conforms to EN 50190, IEC/EN 61800-2, IEC/EN 61800-3 standards UL/CSA certification and to CE marking.

Altivar 312 drives communicate on Modbus and CANopen industrial buses. These two protocols are integrated as standard.

Multiple units can be mounted side by side to save space.

Drives are available for motor ratings between 0.18 kW and 15 kW, with four types of power supply:

- 200 Vac to 240 Vac 1-phase, 0.18 kW to 2.2 kW
- 200 Vac to 240 Vac 3-phase, 0.18 kW to 15 kW
- 380 Vac to 500 Vac 3-phase, 0.37 kW to 15 kW
- 525 Vac to 600 Vac 3-phase, 0.75 kW to 15 kW

Lexium 32 servo drive

- Voltage range:
  1-phase 100 – 120 Vac or 200 – 240 Vac
  3-phase 200 – 240 Vac or 380 – 480 Vac
- Power: 0.4 to 6 kW
- Rated torque: 0.5 to 36 Nm
- Rated speed: 1500 to 8000 RPM
- The compact design allows for space-saving installation of the drive in control cabinets or machines.
- Features the "Power Removal" (Safe Stop) functional safety function, which prevents the motor from being started accidentally. Category 3 with machine standard EN 954-1
- Lexium 32 servo amplifiers are fitted with a brake resistor as standard (an external brake resistor is optional)
- Quick control loop scan time: 62.5 µs for current control loop, 250 µs for speed control loop and 250 µs for position control loop
- Operating modes: Point-to-point positioning (relative and absolute), electronic gears, speed profile, speed control and manual operation for straightforward setup.
- Control interfaces:
  CANopen, Modbus or Profibus DP
  Analog reference inputs with ± 10 Vdc

Compact NSX main switch

Compact NSX rotary switch disconnectors from 12 to 175 A are suitable for on-load making and breaking of resistive or mixed resistive and inductive circuits where frequent operation is required. They can also be used for direct switching of motors in utilization categories AC-3 and DC-3 specific to motors.

- 3-pole rotary switch disconnectors, 12 to 175 A
- Pad lockable operating handle (padlocks not supplied)
- Degree of protection IP65

Preventa Safety Module: XPSAC5121

Main technical characteristics:

For monitoring	Emergency Stop
Max. Category accord. EN 954-1	3
No. of safety circuits	3 N/O
No. of additional circuits	1 Solid-State
Indicators	2 LED
Power supply AC/DC	24 Vdc
Response time on input opening	< 100 ms
AC-15 breaking capacity	C300
DC-13 breaking capacity	24 Vdc / 2 A - L/R 50ms
Minimum voltage and current	17 V / 10 mA
Dimensions (mm)	114 x 22.5 x 99
Connection	Captive screw-clamp terminals
Degree of protection	IP20 (terminals) IP40 (casing)

Safety modules XPS AC are used for monitoring Emergency Stop circuits conforming to standards EN ISO 13850 and EN 60204-1 and also meet the safety requirements for the electrical monitoring of switches in protection devices conforming to standard EN 1088 ISO 14119. They provide protection for both the machine operator and the machine by immediately stopping the dangerous movement on receipt of a stop instruction from the operator, or on detection of a fault in the safety circuit itself.

Magelis Display Terminal: HMISTU655

Magelis STU Small Panel

- High-definition TFT QVGA with 24 Vdc power supply
- 64k colors
- Serial port RJ45 RS485/232 multiprotocol interface
- 10/100 BaseT RJ45 Ethernet port interface
- 1 mini USB Device + 1 USB Host 2.0 interface
- Temperature range: 0..+ 50 °C
- Certificates: UL, CE, cULus, C-Tick

SoMachine OEM Machine Programming Software: MSDCHNSFSNV30 or MSDCHLLMUV30S0

SoMachine is the OEM solution software for developing, configuring and commissioning the entire machine in a single software environment, including logic, motion control, HMI and related network automation functions.

SoMachine allows you to program and commission all the elements in Schneider Electric's Flexible and Scalable Control platform, the comprehensive solution-oriented offer for OEMs, which helps you achieve the most optimized control solution for each machine's requirements.

Flexible and Scalable Control platforms include:

Controllers:

HMI controllers:
- Magelis XBTGC HMI controller
- Magelis XBTGT HMI controller
- Magelis XBTGK HMI controller

Logic controllers:
- Modicon M238 Logic controller
- Modicon M258 Logic controller

Motion controller
- Modicon LMC058 Motion controller

Drive controller:
- Altivar ATV-IMC Drive controller

HMI:

HMI Magelis graphic panels:
- XBTGT, XBTGK and XBTGH
- HMISTU and HMISTO

SoMachine is a professional, efficient, and open software solution integrating Vijeo Designer.
It integrates also the configuring and commissioning tool for motion control devices.

It features all IEC 61131-3 languages, integrated field bus configurators, expert diagnostics and debugging, as well as outstanding capabilities for maintenance and visualization.

SoMachine integrates tested, validated, documented and supported expert application libraries dedicated to Packaging, Hoisting and Conveying applications.

SoMachine provides you:
- One software package
- One project file
- One cable connection
- One download operation

Contact

Homepage	http://www.schneider-electric.com

As standards, specifications and designs change from time to time, please ask for confirmation of the information given in this publication.